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AN INVESTIGATION INTO THE OPPORTUNITIES AND CHALLENGES FOR A LOW CARBON TOURISM ECONOMY IN THE SOUTH WEST OF ENGLAND

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AN INVESTIGATION INTO THE OPPORTUNITIES AND CHALLENGES FOR A LOW-CARBON TOURISM ECONOMY IN THE SOUTH WEST OF ENGLAND

by

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Copyright Statement

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Author's Declaration

At no time during the registration for the degree of Doctor of Philosophy has the author been registered for any other University award without prior agreement of the Graduate Sub-Committee.

Work submitted for this research degree at the Plymouth University has not formed part of any other degree either at Plymouth University or at another establishment. This study was self-financed with the exception of the fees which were covered by South West Tourism before its demise in 2011.

A programme of advanced study was undertaken, which included postgraduate courses in qualitative and quantitative methods, and specific training in stakeholder dialogue. Relevant scientific seminars and conferences were regularly attended at which work was often presented; external institutions were visited for consultation purposes and several papers prepared for publication.

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Abstract

An investigation into the opportunities and challenges for a low-carbon tourism economy in the South West of England

Emma Rachel Whittlesea

Achieving a reduction in greenhouse gas emissions has become a key challenge facing global society and its economies. Despite this, tourism policy and strategic planning rarely acknowledge carbon mitigation as a strategic objective and tourism as a sector is rarely recognised in low-carbon plans. This situation represents a substantial challenge, as tourism and travel have a high-carbon impact and carbon mitigation is hindered by lack of carbon data, and a continued drive for economic growth.

The purpose of this thesis was to investigate the effectiveness of carbon footprinting and scenario modelling to help examine the opportunities and challenges for implementing low-carbon tourism pathways in destinations, and to consider how the opportunities could be enabled. The 'REAP Tourism' footprint tool was used to investigate the carbon impact of visitors to destinations across South West England. The purpose was to estimate emissions, suggest a baseline footprint and offer alternative growth and mitigation scenarios of how tourism could more effectively reduce emissions. Through participatory workshops, evaluation questionnaires and semi-structured interviews, stakeholders identified the limitations and benefits of carbon modelling and the challenges and opportunities for a transition towards low-carbon tourism in destinations.

The results demonstrated that the carbon footprint was a useful and informative indicator. The baseline data and scenarios provided a basis for constructive low-carbon dialogue with tourism stakeholders, which helped to challenge current thinking and facilitate the co-creation of ideas and potential interventions. A range of low-carbon opportunities and challenges were identified relating to the cultural, political and structural components of tourism governance.

A conceptual low-carbon transition framework is proposed, to illustrate the opportunities. Stakeholder dialogue and debate, informed by quantitative and qualitative data, is central to the framework. Cultural, political and structural opportunities for change are also identified. Further investigation is needed to test the framework and examine the levels of influence and capabilities of different types of tourism stakeholders. The use of integrated environmental-economic indicators to inform national and local tourism policy and strategy, also require application. This thesis contributes to an emerging body of knowledge on the governance of low-carbon destinations, from a practical, methodological and conceptual basis.

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List of Abbreviations

CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
DCMS	Department for Culture, Media and Sport
DECC	Department of Energy and Climate Change
DMO	Destination Management Organisation
GHG	Greenhouse Gases
KPIs	Key Performance Indicators
ONS	Office for National Statistics
PVD	Per Visitor Day
REAP	Resource Energy Analysis Programme
SW	South West
SWT	South West Tourism
SWTA	South West Tourism Alliance
TIU	Tourism Intelligence Unit
TSA	Tourism Satellite Account
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNWTO	United Nations World Tourism Organisation
VE	VisitEngland
WBCSD	World Business Council for Sustainable Development
WRI	World Resources Institute
WTTC	World Travel and Tourism Council

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1 Introduction

1.1 Chapter Introduction

Tourism is a rapidly growing economic sector with a predicted global annual growth rate of 3.3% between 2010 and 2030 (UNWTO, 2011). This equates to an average annual increase of 43 million international tourist arrivals per year, or a total of 1.8 billion arrivals by 2030 (UNWTO, 2011), from a baseline of 565 million tourists in 1995 (UNWTO, 2001). In the UK, tourism is the fifth largest industrial sector and is estimated to be worth £114bn per year (Deloitte, 2008). In the era of climate change, achieving a reduction in greenhouse gases has become a key challenge facing the global economy. Tourism is energy intensive and dependent (Becken and Hay, 2007), and almost every tourism service and product utilises energy and has an associated carbon impact.

Tourism (alongside aviation and transport which are fundamental to tourism) was identified as one of six major UK economic sectors in the 'danger zone' when assessed against regulatory, physical, reputational and litigation risks of climate change versus level of preparedness (KPMG, 2008). Globally, it is estimated that tourism emits between 5% and 14% (if radiative forcing is taken into account) of global anthropogenic carbon dioxide (CO_2) emissions, with 75% of this coming from transportation, of which aviation contributed over half (Simpson, Gössling, Scott, Hall and Gladdin, 2008). The issues of accountability and responsibility for the costs and reduction of emissions lead to considerable debate (Gössling et al., 2010) but appear not to have resulted in much action.

The Climate Change Act (Crown, 2008) set a national UK obligation to reduce greenhouse gas emissions by 80% from 1990 levels by 2050, with a series of intermediate targets. Initial investigations showed that the Government's efforts to develop a strategy, policy and indicators for climate mitigation in response to the

Act, failed to acknowledge tourism. Despite international tourism efforts to raise the profile of climate mitigation and a carbon reduction goal of 25-30%[1] below 2005 levels by 2020 (Simpson et al., 2008; WTTC, 2009), mitigation barely features in UK tourism policy or planning. The strategic focus and performance indicators for tourism remain the same, to increase tourism numbers and expenditure, without reflecting environmental externalities, in particular the sector's contribution to emissions (Dickinson, Robbins, and Lumsdon, 2010).

However, climate change is becoming a growing area in tourism research, with 1.7% of papers published between 2000 and 2009 in four leading tourism journals dedicated to the topic (Scott, 2011). This includes studies that consider the measurement and management of tourism's greenhouse gas emissions (Jones and Munday, 2007; Dwyer, Forsyth, Spurr and Hoque, 2010; Jackson, Kotsovos and Morissette, 2008; Peeters and Dubois, 2010; Gössling and Schumacher, 2010; Scott, Peeters and Gössling, 2010; McKercher, Prideaux, Cheung and Law, 2010; Howitt, Revol, Smith, and Rodger, 2010; Konan and Chan, 2010; Kuo and Chen, 2009; Kelly and Williams, 2007; Walz, Calonder, Hagedorn, Lardelli, Lundstrom and Stockli, 2008; Becken and Patterson, 2006; Patterson and McDonald, 2004).

Despite an increase in tourism carbon footprinting studies, relatively little work has been done in the UK (or elsewhere for that matter) to examine the issue at the sub-regional destination level or to quantify and compare tourism greenhouse gas emissions across multiple destinations. Another challenge is that much of the tourism sector remains unaware of the implications of emission targets and the consequences of a transition towards a low-carbon system (Scott, Peeters and Gössling, 2010). A significant transformation of the tourism economy requires a shift from 'business as usual' models, as emission targets do not appear feasible

[1] The World Travel and Tourism Council set an interim target of 30% by 2020 subject to an international agreement on global emissions reduction, or 25% by 2020 in the absence of such an agreement (WTTC, 2009)

without volumetric changes (Scott, et al., 2010; Hall, 2009). This presents a research challenge. How can tourism stakeholders be engaged and mobilised to manage tourism’s carbon footprint?

This thesis extends existing research and focuses on two main shortcomings. If the UK tourism industry is to respond to the challenges of carbon reduction, it needs to examine the ‘carbon footprint’ of tourism across destinations consistently and inform and engage tourism stakeholders in the issue. Secondly, in the context of destination management, there is a need to examine whether carbon footprint data are useful for tourism stakeholders and identify the challenges and opportunities for a transition to a low-carbon tourism system.

1.2 Background and Context

Tourism can be defined as “visiting for at least one night for leisure and holiday, business and professional or other tourism purposes” (Tribe, 2011, p3), and can also include day trips, reflecting a temporary movement of people to places outside the normal workplace or home. Similarly, the World Tourism Organisation’s definition of ‘tourism’ is “the activities of persons travelling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business and other purposes” (UNWTO, 1995, p1).

Tourism has become an increasingly popular global industry and at the macro-economic scale, is a major contributor to income and prosperity, and is one of the world’s largest and fastest growing economic sectors (UNWTO, 2012, 2015). The industry continues to diversify and expand, attracting new destinations, markets and new products, experiences and services. In 2011, tourism represented 5% of global GDP and 30% of the world’s exports of services, generating close to 3 billion US$ a day in overall export income, ranking 4th after fuels, chemicals and automotive products (UNWTO, 2012). Tourism also represents one in every 12 jobs, making it one of the world's top job creators (UNWTO, 2012).

Europe maintains robust tourism growth and a significant share of the market, surpassing half a billion arrivals in 2011 (UNWTO, 2012). Despite recent economic uncertainty numbers continue to rise across Europe and in 2014 international tourist arrivals were 581.8 million (UNWTO, 2015). The United Kingdom ranked eighth for international tourist arrivals (32.6 million, 5% increase), seventh for international tourist receipts (45.3 billion US$, 10.3% increase), and fourth in the top ten spenders (57.6 billion US$), equating to 893 US$ per capita (UNWTO, 2015). The Tourism Towards 2030 report (UNWTO, 2011) expects this long-term growth pattern to continue, although the viability and implications remain unknown. Hall (2009) recognises that, despite good intentions and statements of concern from the United Nations World Tourism Organisation (UNWTO) and the World Travel and Tourism Council (WTTC), the negative effects of tourism are not being addressed.

Growth in tourism, especially the increase and volume of trips, is seen to be a key factor in the increasingly negative environmental impact of tourism (Hall, 2009). Recent studies combining carbon modelling with future growth scenarios suggest that efforts to reduce visitor emissions and improve energy efficiency are outstripped by the rate of growth (Gössling, Hall, and Weaver, 2009; Peeters and Dubois, 2010). This growth is measured and the economic benefits identified, but the impact and corresponding growth in emissions is not. Hall (2009) identifies that great efforts have been made to model economic impacts, but no equivalent efforts have been made to consider environmental impacts.

Deloitte (2010) forecasted growth of 3% per annum for England, equivalent to an annual growth of 5% including inflation. If this is achieved, the cumulative increase in the English market will be 64% by 2020, resulting in an estimated additional £50 billion in expenditure and 225,000 jobs, outstripping other major sectors of the national economy (VisitEngland, 2011). The Deloitte (2010) report also identified climate change as a key policy consideration for the UK visitor economy.

Responsibility for tourism comes under the Government Department of Culture, Media and Sport (DCMS), which has an annual Funding Agreement with VisitEngland to deliver against their departmental strategic objectives. Neither the priorities, nor the funding agreement appear to mention climate change or emissions reduction. The focus is on growing the visitor economy, improving England's image abroad, and improving access for the British citizen to a better visitor product (VisitEngland, 2011; VisitBritain and VisitEngland, 2010). There appears to be no national commitment or plans for tourism to reduce its carbon footprint, despite: the UK endorsing[2] the Davos Declaration (UNWTO, 2007) which urged the sector to take action to reduce emissions; the WTTC (2009) setting a target to halve emissions by 2050 compared to 2005; and VisitEngland's engagement in Tourism 2023 (Forum for the Future, 2009) which considered the implications of a carbon constrained world.

1.2.1 Tourism as a major contributor to greenhouse gases

Increasing scientific concern around climate change became the focus of political and economic debate in 1988 with the establishment of the Intergovernmental Panel on Climate Change (IPCC). The 1988 Toronto Conference proposed global emissions cuts of 20% by 2005 and the United Nations General Assembly agreed a 1988 resolution (43/53) that climate change was a "common concern of mankind" (Bodansky, 2001, p28). A later 1990 resolution (45/212) led to the adoption of the UN Framework Convention on Climate Change (UNFCCC) at the Rio de Janeiro

[2] UK endorsement of the Davos Declaration at the Ministers Summit on Tourism and Climate Change in London (13th November 2007)

‘Earth Summit’ in 1992 (Bodansky, 2001; UNFCCC, 1992). Since 1995, when the first Conference of the Parties (COP) met in Berlin (UNFCCC, 1995), there have been annual climate conferences, an array of scientific research (IPCC, 2007), political and public awareness activity (Gore, 2006; Stern, 2006), the World’s first international agreement and binding targets to reduce emissions (Kyoto Protocol) (UNFCCC, 1998), and tools developed for industry engagement (EU Emissions Trading Scheme, Carbon Disclosure Project). Combined, these have helped to drive climate change into the political and corporate arena internationally.

The Fifth Assessment Report from the IPCC (2013, p4) concludes: “Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased”. The report also states that “It is *extremely likely* that more than half of the observed increase in global average surface temperature from 1951 to 2010 was caused by the anthropogenic increase in greenhouse gas concentrations and other anthropogenic forcings together” (p15). The term ‘extremely likely’ which is defined as >95% (p4) reflects a high degree of confidence (IPCC, 2013). Human-induced influences on climate are also strengthened by other scientific studies (Richardson et al, 2009; Anderegg et al, 2010).

The case for expeditious mitigation is not just environmental but also economic. Unabated climate change is estimated to cost the world from 5-20% of GDP each year, with a tonne of CO_2 costing $85 in social damages, yet these emissions could be cut for less than $25 (Stern, 2006). Stern estimated that the net benefits of shifting the world economy to a low-carbon pathway could be around $2.5 trillion a year, through mitigation policies such as carbon pricing, improved technology, and removing barriers to behavioural change.

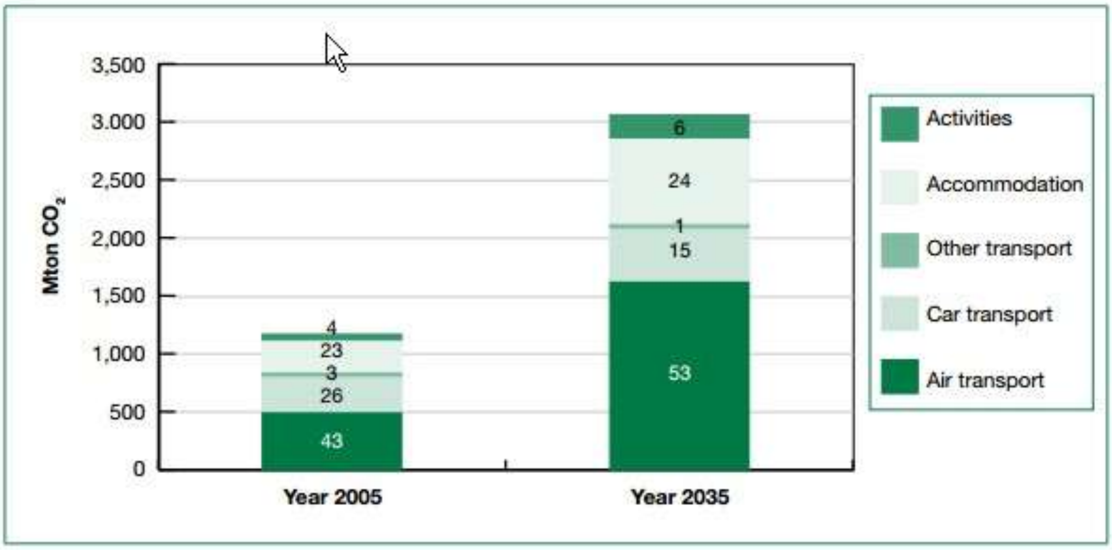
Tourism is a climate-sensitive and vulnerable industry, with changes in climate affecting tourism destinations and sub-sectors across the globe (Buckley, 2008; Perry, 2006; Pickering and Buckley, 2010; Scott, McBoyle, Minogue, and Mills, 2006). The impacts of climate change will be direct and indirect and are likely to have a negative and unevenly distributed effect on global GDP (Berrittella, Bigano, Roson, and Tol, 2006). The industry is demonstrating action to reduce climate related risks and reduce vulnerability to climate change impacts (Becken and Hay, 2007; Simpson et al., 2008). However, there is less attention directed to reducing the size of tourism's carbon contribution. Hall (2011a) estimates that between 2001 and 2007, emissions from global tourism increased from 1400Mt of CO_2e[3] to 1848 Mt of CO_2e (a 32% increase).

Figure 1.1 shows the 2005 global baseline emissions for tourism and the growth trajectory under a 'business as usual' scenario, and explores future carbon emissions from tourism (UNWTO, UNEP and WMO, 2008). Tourism emissions could more than double by 2035, with the most notable increase coming from air travel. The World Economic Forum (2009) estimates an annual increase of 2.5% for tourism CO_2 emissions until 2035, excluding aviation, which is expected to grow at 2.7% per annum. If the tourism sector is to meet the WTTC carbon reduction goal of 50% below 2005 levels by 2035, or the interim target of 25-30%[4] by 2020 (WTTC, 2009), the results of these two studies suggest that the tourism system requires a fundamental review.

[3] An abbreviation of carbon dioxide equivalent and internationally recognised measure of greenhouse emissions

[4] The WTTC set an interim target of 30% by 2020 subject to an international agreement on global emissions reduction, or 25% by 2020 in the absence of such an agreement (WTTC, 2009)

Figure 1.1: Estimated CO_2 emissions from tourism globally



Source: UNWTO, UNEP and WMO, 2008, Figure 6.4, p.36.
Permission to reproduce this figure has been granted by the UNWTO.

Aside from climate change, another driver for managing energy systems and the resulting emissions is the scenario of 'peak oil'. Tourism operations are highly dependent on oil, in particular transport and aviation. Reduced availability and increased prices will have a significant economic impact and tourism destinations and their products will need to adapt, alongside visitor behaviour and choice, and tourism could act as a driver of social change (Becken and Hay, 2012).

An outcome of the second International Conference on Climate Change and Tourism held in 2007 was the Davos Declaration, which urged the sector to "progressively reduce its greenhouse gas emissions" (UNWTO, 2007, p2). It detailed a range of actions and measures, including "the aim of reducing the carbon footprint of the entire tourism sector" (UNWTO, 2007, p2). The tourism 'industry and destinations' were identified as one of four agents for change and the declaration encouraged 'targeted, multi-disciplinary research' to address regional gaps in current knowledge (UNWTO, 2007). Most relevant to this thesis are actions which encourage leadership in: "implementing concrete measures in order to mitigate climate change throughout the whole tourism value chain, establishing targets and indicators to monitor progress" and to "integrate tourism in the formulation and implementation of regional, national and local level adaptation and mitigation strategies and implementation plans" (UNWTO, 2007, P3). Once a destination baseline footprint has been quantified and its composition known, the areas of highest impact can be identified and future scenarios explored, in order to investigate what mitigation measures and strategies destinations could employ.

1.2.2 Strategic neglect of low-carbon

Environmental resources continue to deteriorate and signal a failure in the world's global economic and accounting systems (Wentworth Group of Concerned Scientists, 2014). For climate mitigation, there is a need to integrate economic and environmental governance in relation to carbon management and energy systems (Compston and Bailey, 2008), as economic measures of success still dominate (Tribe, 2011). Tourism decision makers also tend to work to short term planning horizons, but in an era of climate change, longer term planning is needed even if it is more challenging (Lew, 2010). Scott (2011, p29) concludes in his paper 'why sustainable tourism must address climate change', just because "uncomfortable questions" are raised "is not a justification for retrenchment, but rather demands greater reflection on the future of tourism development in a carbon-constrained global economy".

Within the UK, the Department of Energy and Climate Change (DECC) was set up in October 2008 to bring together energy policy and climate mitigation policy, to ensure energy is secure, affordable and efficient, and to bring about the transition to a low-carbon Britain (DECC, 2010). The UK's Climate Change Act (Crown, 2008) is the world's first legally binding framework for tackling climate change and sets out a framework putting Britain on the path for a low-carbon economy through a legally binding emission reduction target of 80% by 2050 (based on 1990 levels), and a carbon budgeting system to help direct the transition to a low carbon economy. The first budget started in 2008 and requires the UK to cut emissions by 34% on 1990 levels by 2020.

The Carbon Plan (HM Government, 2011) considers future scenarios and sets principles and plans for achieving the emission reductions set in the first four carbon budgets to 2027. It considers how each sector of the economy is expected to contribute to reducing emissions, stimulating low-carbon investment and enhancing energy security. Sectoral plans for electricity, transport, buildings, industry, agriculture and forestry should help to achieve emission reductions in tourism. However, tourism is not recognised in the Carbon Plan (HM Government, 2011), which has no mention of 'tourism', 'tourists' or 'visitors'. The Low Carbon Transport Strategy (Department for Transport, 2009) also only accounts for domestic aviation and shipping. International aviation and shipping were unaccounted for in the 2050 target, carbon budget system, and Carbon Plan. The EU Emissions Trading Scheme[5] included aviation from 2012.

It would appear that efforts to reduce greenhouse gases from tourism are still in early stages and have not formed into a 'co-ordinated sector-wide strategic response', suggesting the climate change mitigation potential of the sector is relatively high (UNWTO, UNEP and WMO, 2008).

1.2.3 Additional sustainability challenges

Research into the social and environmental implications of tourism dates back four decades (Young, 1973; Turner and Ash, 1975), but the extent of tourism's environmental impact is changing. Impacts that in the past were 'local and reversible' are increasingly 'global and irreversible' and will affect future generations (Oreskes, 2004). Tourism is travel dependent, energy and resource

[5] Emissions trading is a market-based tool to regulate and limit greenhouse gases by assigning a price to one emissions permit/credit which is equivalent to one metric ton of emissions (tCO_2e). Carbon emissions trading specifically targets carbon dioxide.

intensive, and its environmental implications can have local and global consequences.

Sustainable tourism has been described as vaguely defined, misinterpreted and misused (Lansing and De Vries, 2007; Mowforth and Munt, 2009). It tends to focus on ‘sustaining’ the long-term viability of the industry, rather than pursuing long-term ‘sustainable development’ (Sharpley, 2000). One key challenge for sustainable tourism is lack of control and enforcement over tourism development and operations through feasible and practical policies and measures (Liu, 2003; Butler, 2010). As Peeters (2012, p1040) points out, “almost none of the statements or codes are binding or causing serious repercussions where they are violated by the sector”. This is not helped by the fragmented, private, profit motivated, multi-sector and global character of the industry (Lansing and De Vries, 2007; Sharpley, 2009).

Another key challenge for sustainable tourism is balancing between often conflicting economic, social and environmental considerations (Cater, 1995; Hunter, 2002; Hall, 2011). The outcome should not just be about minimising environmental costs but needs to recognise thresholds, benefits, capacities and absorption abilities, to ensure “total natural capital is maintained, not continuously eroded” (Weaver, 2012, p1039).

Butler (2010, p14) suggests that lack of responsibility and control over destination development and promotion makes sustainable tourism a misnomer: “without responsibility there could be no solution” and “without control there can be little chance of responsibility”. The challenges of responsibility and control appear to be key considerations for the mitigation of emissions at destination level. Recognising the complexity of tourism roles, responsibilities and the actions of stakeholders, alongside communities and tourists with respect to destination governance, is also an important consideration (Jamal and Watt, 2011).

Globalisation, population growth, economic affluence, business expansion, emerging economies and increasing travel suggests that tourism will continue to grow in the coming decades (DMAI, 2008; UNWTO, 2011). This will fuel increasing competition within the industry and Destination Management Organisations (DMOs) will have an increasingly important role and responsibility (Presenza, Sheehan and Ritchie, 2005). Bramwell and Lane (2011, p412) examined the governance of tourism and sustainability, showing that if progress is to be achieved, governance needs to be “tailored and effective”, providing clear direction and engaging tourism stakeholders and communities, with “appropriate institutions, decision-making rules and established practices”. Hall (2011) suggests that governance of sustainable tourism could be improved by acknowledging policy failure and considering opportunities to address and learn from this.

1.2.4 Thesis focus

Appropriate indicators have long been recognised as playing a significant role in driving forward the sustainability agenda (Butler, 1991), but few indicators address environmental ‘impacts’ (Hughes, 2002). The design, development and application of carbon measurement can be seen as a strategic activity (Callon, 2009): determining what and how to measure; how the results will be utilised; and the implications for decision making and accountability. As things stand, the success or failure of emissions reduction policies, especially in relation to tourism, is largely a matter of guesswork, as there are no common accounting methods or tools. Further exploration would be helpful at the local destination level to take carbon footprint results one step further, and to engage stakeholders in identifying appropriate responses and critical success factors.

If the tourism industry is serious about embracing a low-carbon future, it would seem important that the sector and tourism destinations are able to measure, interpret and manage their carbon impact. The problem that this thesis addresses is threefold. The first is that tourism's carbon footprint is considerable and projected to rise (UNWTO, UNEP and WMO, 2008; Dubois, Peeters, Ceron, and Gössling, 2011; Peeters and Dubois, 2010). Yet, there is no consistent or comparable carbon measurement for tourism destinations. This is despite the urgent need recognised by government (Crown, 2008; Crown, 2009a) and the industry (WTTC, 2009) to reduce greenhouse gas emissions. This thesis investigates the carbon footprint of tourism in a region and across its sub-regional destinations (by local government area), and explores the results and implications with tourism stakeholders.

Secondly, there is a need to bridge the gap between intentions and actions. Despite widespread recognition that emissions need to be reduced, carbon mitigation would appear absent from tourism policy and plans at destination level. Thus, an investigation of the challenges and opportunities of embedding carbon mitigation into destination management is timely, and requires investigation in order to understand the practical implications of the low-carbon agenda.

Thirdly, there is a lack of clarity as to who is responsible for carbon mitigation in the tourism and travel sector, and what role destination management should play. This can mean that "Action can be put off, blame assigned to other sources and any need to take up accountability obfuscated" (Marsden and Rye, 2010, p20).

1.3 Aims and Research Questions

Building on the foregoing discussion, the aims of this thesis are: (i) to investigate the effectiveness of carbon footprinting and scenario modelling to inform destination management; and (ii) from this, to examine the opportunities and challenges to implementing low-carbon tourism pathways. The three core research questions that were identified and are addressed by this thesis are:

1. How effective is the carbon footprint to inform and engage tourism stakeholders in the transition to a low-carbon tourism economy?

2. What are the strategic opportunities and challenges for a low-carbon transition in tourism destinations?
3. How can the opportunities be enabled?

1.4 Study Area

The study area for the research was the South West of England. The focus was primarily the seven local government administrative areas and associated Destination Management Organisations (DMOs). The research recognised tourism destinations that had district-wide local government boundaries and associated Area Tourism Partnerships (ATPs). The areas had variable geographies and sizes, different tourism compositions and products, and different tourism management arrangements. The South West region of England provided the basis for the quantitative and qualitative analysis.

The South West is a unique area to conduct this study, because regional and local government and the tourism industry had demonstrated longstanding commitments to sustainable tourism and low-carbon development (Coles, 2008). The study area was also influenced by funding, as the thesis was part-funded by the South West regional tourist board before its closure in 2011. The study area is described further in section 3.2.

1.5 Methodology

This research was conditioned by a review of the literature and the experience of the researcher, who worked in the tourism sector in a sustainable tourism role. The line of enquiry was to apply an inductive ‘fact-finding’ strategy, which consisted of observation, analysis, inference and confirmation (Potter, 2006). The research approach taken in this study is grounded in both the critical and interpretive paradigms and uses a mix of quantitative and qualitative methods which are interactive and subjectivist. Methodologically, this research employed a practical approach, incorporating carbon modelling, scenarios and qualitative participatory techniques through four linked stages. These are depicted in Figure 1.2 and are summarised in the following sections; however, the full detail of the methods is provided in Chapter 3. The data collection and analysis, alongside the research observations and findings, were used to establish regularities and derive the resulting framework (Bryman, 2001).

Figure 1.2: Four stages of the methodology in summary

Source: Author

1.5.1 Stage 1 - REAP Tourism baseline carbon modelling

The first part of the research quantified and examined the emissions from tourism to explore a baseline carbon footprint and quantify the contribution of different components of tourism to greenhouse gas emissions. The research applied the Resource Energy Analysis Programme for Tourism (REAP Tourism), a model developed between South West Tourism and the Stockholm Environment Institute to investigate the full greenhouse gas impact of visitors (Whittlesea and Owen, 2012). The design of REAP Tourism drew on a review of existing studies and reflects several methodological and theoretical refinements, and aligns with the Greenhouse Gas Protocol (WRI and WBCSD, 2004).

The technical aspects of the model are described in Chapter 3, but the initial research findings were also published in the Journal of Sustainable Tourism's *Special Issue* on *Scenario Planning for Sustainable Tourism* (Appendix 1). The research accounts for both the direct and indirect emissions (where practicable), exploring both relative and absolute values, looks at regional and sub-regional geographies, and explores different visitor types and profiles. The baseline modelling:

1. compared carbon footprints for different visitor types (day, domestic and international) for areas across the South West;
2. explored the construction of carbon footprints in different destinations;
3. measured the carbon impact of events;
4. examined the profiles of different visitor trips e.g. relative impacts of a family holiday versus a luxury weekend break.

1.5.2 Stage 2 – REAP Tourism scenario modelling

The UK's first carbon budget (Crown, 2008) set a target reduction of 18% on 2008 levels by 2020 and provided the target framework for the second part of the research, to undertake scenario modelling to examine alternative 2020 scenarios. REAP Tourism was used to model the scenarios and included the impact of different levels and types of growth (including the VisitEngland 3% growth in value 2020 target), and the impact of mitigation strategies.

The purpose was to examine where to focus emission reduction efforts for tourism at the destination level and investigations covered both traditional supply side measures/interventions and demand side measures. The objective was then to envisage what a low-carbon tourism system could look like in the South West, and according to Compston and Bailey (2008) this envisioning approach should facilitate identification of how to get there.

Scenario modelling can be a key tool for strategic planning and decision-making through the development of informed projections based on trends and reasonable assumptions. This is an increasingly important tool to explore and investigate future emissions under different development and mitigation pathways and has been used to review global tourism emissions (UNWTO, UNEP and WMO, 2008). Modelling scenarios also help to investigate how the greenhouse gas visitor footprint of an area may change in future and how this could be reduced.

1.5.3 Stage 3 – Participatory planning workshops

The participatory planning workshops were used to present the carbon footprint results and examine these further with a range of strategic tourism stakeholders. They were designed to encourage interaction and facilitate discussion of the findings. Two, three hour facilitated workshops were held, one in Somerset and one in Cornwall. Each workshop was organised and promoted in conjunction with the local Destination Management Organisations and, collectively, the two workshops engaged 35 tourism stakeholders.

The workshop programme was designed to promote a two-way exchange to enable stakeholders to be the recipients of the research findings, whilst simultaneously providing knowledge and expertise to shape the research. The data was captured by audio recordings of each sub-group as well as flip-chart notes of key points linked to the research objectives.

1.5.4 Stage 4 – Evaluation and semi-structured interviews

At the end of the workshops participants were asked to complete an evaluation questionnaire comprising ten closed and open questions. Those participants who had to leave early were sent a follow up email providing an electronic link to the questionnaire. There were 34 participants that completed the evaluation questionnaire (97%), which explored ‘individual’ participant’s perspectives. The questionnaire investigated awareness of climate change mitigation, usefulness of the data, effectiveness of the process to engage and inform stakeholders, the relationship between destination management and the low-carbon agenda, and how data could support and influence decision making processes.

After the two workshops, a total of 16 semi-structured ‘expert’ (Gubrium and Holstein, 2002) interviews were conducted with tourism stakeholders. The target audience was identified as the Chair, CEO, Strategic Director or Senior Manager of Destination Management Organisations (or their equivalent) and other strategic bodies which have an influence on them. The interviews explored further the outcomes of the workshops to gain clarity, investigate emerging findings, and examine specific areas not covered in detail in the workshops. The semi-structured interviews comprised eight main questions with probing sub-questions that were determined after the workshop outcomes had been analysed. The interview questions followed a funnel structure, which is applicable to a mixed-method research approach, beginning with broad questions which became more specific (Tashakkori and Teddlie, 1998).

The qualitative results (workshops, evaluation questionnaire and semi-structured interviews) were transcribed and analysed using NVivo data analysis software that supports qualitative and mixed-methods research (Bazeley and Jackson, 2013).

1.6 Significance and Contribution

The first part of the research examined emissions from visitors to different sub-regional destinations across the South West. This is one of the first times a consistent footprint methodology based on consumption had been applied across a series of destinations, to compare the size and constitution of the resulting carbon footprints (Whittlesea and Owen, 2012). Although there are some consistencies with existing research, such as the disproportionate impact of overseas visitors, the enhanced level of detail provided by this research provided the opportunity to investigate smaller geographies, explore a more complete footprint from the visitor impact perspective rather than that of the industry, and include sub-sectors that have had limited investigation such as food and shopping.

The baseline results were used to undertake scenario modelling of alternative 2020 scenarios, looking at a range of growth and mitigation strategies within the context of the national target framework. It would seem this was the first time this had been undertaken in England to envision low-carbon pathways for a regional tourism destination. Despite the development of tourism carbon footprint studies, it appears that little if any research has examined the usefulness of results with tourism stakeholders. This research explored whether the results were useful and could be effective to aid and improve strategy toward a low-carbon tourism system.

There were also gaps in knowledge of the challenges and opportunities experienced by stakeholders at the destination level, in terms of progressing a low-carbon agenda in tourism. Using the South West as a case study, the qualitative research investigated these findings further and used three perspectives of governance to structure the results. This led to a conceptual contribution through the development of a low-carbon transition framework.

Overall, this thesis provides a contribution to knowledge on a number of counts: practical, political, conceptual and methodological. It should help to inform further academic and practitioner efforts towards low-carbon tourism governance and destination management in the UK.

1.7 Structure of the Thesis

This thesis is structured into seven chapters, depicted in Figure 1.3

Figure 1.3. Chapter 1 comprises the Introduction which provides the background, details what will be investigated and summarises the significance of the findings. Chapter 2 (the Literature Review) covers theoretical, political and practical knowledge and fields of learning that are relevant to this thesis. This includes the nature, trends and scale of the tourism industry and reviews relational theories with environmental sustainability. This section also reviews the strategy and institutional frameworks for tourism and climate change, with a particular focus on destination management. There is also a review of studies that investigate the emissions associated with tourism.

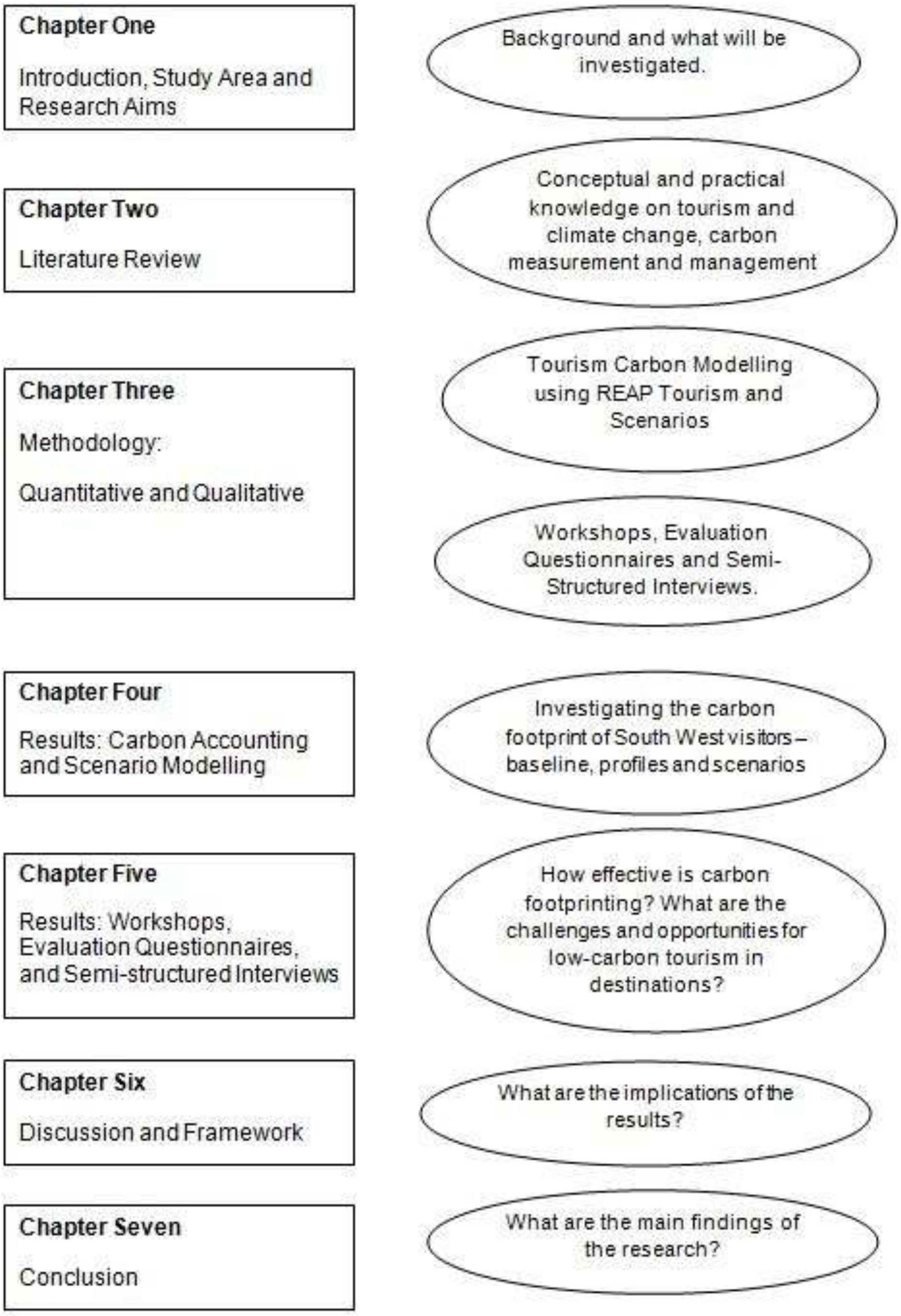
Chapter 3 explains and justifies the methodological approach employed. The chapter details the quantitative carbon footprint and scenario modelling methods using REAP Tourism and describes the qualitative research using participatory stakeholder workshops, evaluation questionnaires, and semi-structured interviews. Issues of validity, reliability and researcher positionality are also discussed.

Chapter 4 investigates the quantitative carbon footprint results of visitors to destinations across the South West, examining the baseline, profiles of different visitor types, and scenarios combining different growth and mitigation strategies. Chapter 5 evaluates results from the workshops, questionnaires and semi-structured interviews investigating the usefulness of carbon footprinting and identifies the challenges and opportunities for low-carbon tourism in destinations.

The discussion in chapter 6 revisits the three research questions and reviews the findings using three perspectives on governance: cultural, political and structural (Ancona, Kochan, Scully, Van Maanen, and Westney, 2004). The chapter also proposes a conceptual transition framework for low-carbon tourism in destinations.

Chapter 7 concludes the thesis by summarising the main research findings, synthesising the practical, conceptual and methodological contributions, reflecting on the limitations, and highlighting avenues for future research.

Figure 1.3: Structure of the Thesis



2 Literature Review

2.1 Introduction

This literature review examines current tourism trends and their associated greenhouse gas emissions, performance measures for tourism, and processes for accounting for environmental externalities and impacts. This is contextualised by a critical review of the UK's strategic frameworks for tourism and for climate change, including analysis of their compatibility. The emergence and development of tourism carbon footprint studies and the findings are then explored, and key challenges for measurement and the application of carbon footprinting are discussed. Finally, some of the main drivers and tools to support a shift toward low-carbon tourism are examined.

2.2 Tourism and Climate Change Mitigation

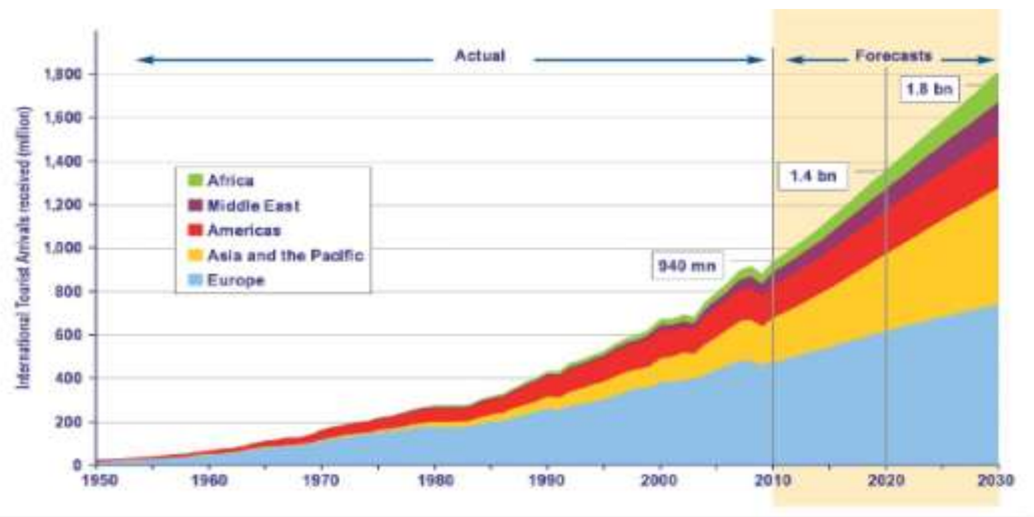
International tourism continues to maintain uninterrupted growth despite many source markets experiencing economic challenges. Total international arrivals worldwide reached one billion in 2012 for the first time in history, a 261% increase from 1980 (277 million) (UNWTO, 2012, 2013). Robust growth continues and in 2014, this was up to 1.13 billion international tourist arrivals and international tourism receipts of 1245 billion US$ (UNWTO, 2015). Tourism is an important economic sector in both developed and less economically developed countries and can be a vehicle to support regeneration and economic development strategies (UNWTO, 2012). In some countries with developing economies, notably Small Island Developing States (SIDS), tourism accounts for over 25% of Gross Domestic Product (GDP) and is the highest source of foreign exchange earnings (excluding oil) in most out of the 48 less economically developed countries (UNWTO, 2012).

The UNWTO Tourism Towards 2030 report (UNWTO, 2011) projected that global growth in international tourism will continue between 2010 and 2030, but at a lower rate of 3.3% annually compared with the average annual 4.2% observed between 1980 and 2010. This equates to an average annual increase of 43 million extra international tourist arrivals per year, or a total of 1.8 billion arrivals by 2030. This is due to four factors (UNWTO, 2011):

- higher base volumes, so smaller increases still add substantial numbers;
- lower GDP growth as economies mature;
- lower elasticity of travel to GDP;
- increasing transport costs.

Figure 2.1 illustrates historic trends and forecasts for international tourist arrivals and projects continued growth and an expected change in the proportional share of inbound tourism by region of destination. The market share of destinations in emerging economies is projected to surpass advanced destinations in 2015, with Europe receiving 20% less proportionally by 2030 (UNWTO, 2012). However, the international tourist arrivals for Europe are still projected to rise steadily.

Figure 2.1: International world tourist arrivals (1950 - 2030)



Source: UNWTO, 2012, p14.
Permission to reproduce this figure has been granted by the UNWTO.

Many developed countries have an international tourism 'balance of payments' deficit, where the amount of spend on foreign tourism exceeds the earnings from inbound tourism. For example, the UK experiences a significant annual deficit, which in 2011 was £13.7 billion (ONS, 2013). This presents a challenge for domestic tourism in the UK, as only 20% of people take holidays at home and less than 40% of holiday expenditure is in the UK (DCMS, 2011).

The tourism industry is directed and driven by these measures, which are primarily indicators of economic contribution. They are used globally and locally to inform strategic frameworks for the tourism sector and include arrivals, spend per head, contribution to employment, and the monetary value of tourism services (GDP, Gross Value Added, Gross National Product, balance of payments). However, these symbols of progress have limitations and are being challenged for misleading us into the current economic and environmental crisis (Stiglitz, Sen and Fitoussi, 2008; Stiglitz, 2009). For example, GDP does not distinguish harmful or inequitable economic activity, and does not consider the negative effects on well-being and the environment, including conflict with the global climate crisis (Costanza, Hart, Posner, and Talberth, 2009; Stiglitz, 2009).

The traditional economic measures of 'progress' in tourism clearly do not present the full story of the sector's health or its effects. The focus on international arrivals and receipts is not sufficient for a low-carbon economic system, they only reflect market transactions and the amount of money and people flowing through the system. There is no detail about the quality of the visitors, where or how their spend enters the local economy, or their social and environmental impact – for example, level of emissions. Yet, despite sustainable tourism indicators being developed by the UNWTO almost 20 years ago to broaden measurement (UNWTO, 1996), they have not been mainstreamed in tourism reporting, policy and planning. Environmental indicators considering energy use and carbon emissions need to be incorporated if a low-carbon economic system is the goal, but the quality and availability of data will be a restricting element .

Researchers have identified a strong correlation between increased economic wealth and increased environmental degradation, including climate change (WCED, 1987; Agarwal and Narain, 1991; Redclift, 2005). Wealth is a key driver of energy use and carbon dioxide emissions at both a country and individual level (IEA, 2004; Lenzen et al., 2006; Hurth and Wells, 2007). Prosperity is acknowledged as a measure of economic activity but is also an indicator for "*per capita* resource consumption" (Buckley, 2012, p530). Some have argued that, in the long-term, increased wealth can result in better environmental conditions at a macro and micro level (Hollander, 2003; IEA, 2004). Buckley (2012) argues that this is more of a pattern than a causal chain and that sustainability can only be improved if prosperity is harnessed by pre-existing social institutions.

The Tourism Towards 2030 report (UNWTO, 2011) identified that projected growth should be moderate, sustainable and inclusive. However, the report failed to detail how this would be achieved and did not examine the viability and impact of long-term tourism growth. From a tourism planning perspective, this is necessary in order to guide tourism decision making and policy. Arguably, tourism production and consumption cannot continue to increase without undermining the ability to produce and consume products in the future (low-carbon or not).

2.2.1 Tourism in a Green Economy

Creative thinking and alternative ideas to 'business as usual' has led to an alternative economic regime which values ecological services and natural capital, known as the 'green economy'. A green economy has been defined by UNEP (2011) as an "economy that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities" or, put simply, an economy which is “low carbon, resource efficient and socially inclusive” (UNEP, 2011a).

The 2012 UN Conference on Sustainable Development supported a transition to a ‘green economy’ in the context of sustainable development and poverty eradication (United Nations, 2012). It has been framed as a ‘win-win’ strategy which could generate millions of jobs, reduce environmental degradation, help achieve the Millennium Development Goals and halve the number in extreme poverty (UNEP, 2011; Sukhdev, Stone and Nuttall, 2010). This could be a more resilient ‘economic’ model (Strand and Toman, 2010) based on evidence that the low carbon and environmental goods and services sector is attracting billions of pounds of investment and rising employment, even whilst broader economic activity slows (Green Alliance, 2012). The UK national government examined the green economy concept (HM Government, 2011a) and identified barriers to be overcome and conditions to enable transition to a thriving green economy, but tourism was not mentioned in the reports. The UNEP Green Economy Report (2011) advocated the green economic approach and presented scenarios showing that investments in greener and sustainable tourism were a means to:

- drive growth;
- create jobs;
- develop local economies;
- reduce poverty;
- reduce costs;
- enhance value;
- respond to ‘visitor demand’;
- and improve environmental conditions (UNEP, 2011).

A key message from the report was that the transition to a green economy required private sector support to address ‘significant challenges’ in energy and greenhouse gas emissions, water consumption, waste management, loss of biological diversity, and effective management of cultural heritage. Some other key findings were that although much of the potential to deliver green economy objectives lay with small and medium-sized enterprises (SMEs), government investment and policies would be required to encourage private sector action and co-ordinated destination planning and tourism strategies (UNEP, 2011b). The interconnected nature of the tourism sector also means that changes in practice could stimulate change in many different public and private actors through supply chains. Arguably, even small changes could have considerable impact.

The green economy paradigm nevertheless has its detractors from a social and environmental perspective. Some consider the 'green economy' to be a diversion tactic to draw attention away from the causes of environmental and ecological damage and to pursue populist economic policies and markets (Spash, 2007, 2012; Stretesky, Long, and Lynch, 2013; TIM Team[6], 2015). From this perspective, the concepts of green economy and green growth are insufficient to deal with climate change and provide "false hope and excuses to do nothing really fundamental that can bring about a U-turn of global greenhouse gas emissions" (Hoffmann, 2011).

The protection of the environment through price mechanisms has also been challenged. Although well intentioned, some claim that it reinforces capitalism and could lead to increased control by international financial institutions and transnational corporations, making it even more problematic for governments to regulate markets (Spash, 2008; Lander, 2011). It has also been suggested that, through the UN's environmental economic projects, conferences (such as Rio+20) and events (e.g. tourism events run by the UNWTO), the discourse of the 'green economy' has been manipulated by those who may be in part responsible for the

[6] http://www.twn.my/tour.htm

environmental crises (Spash, 2011). This raises caution about the extent to which the private sector should be involved.

Tourism may be a rapidly growing sector, but it is far from developing in an environmentally sustainable way (Peeters and Dubois, 2010; Scott, Peeters and Gössling, 2010; Gössling, 2002; Gössling and Hall, 2006). Current legal and governance regimes are not preventing environmental degradation and seem to sustain, not restrain, poorly-guided growth (Pelletier, 2010). Hall (2011) investigates the contribution of tourism to global environmental change (including carbon emissions) and concludes that a steady-state economic perspective is required, which encourages economic sufficiency and efficiency, and qualitative development over aggregate quantitative growth (Hall, 2010; Hall, 2011).

2.2.2 Incorporating Environmental Externalities and Impacts

Environmental externalities are described as the "costs and benefits arising from production or consumption of goods and services which are not reflected in market prices" (Tribe, 2011, p389). These can be beneficial or negative, such as waste, noise and greenhouse gas emissions. Environmental economics helps to account for environmental externalities and seeks to consider economic development and growth in more than just traditional monetary terms. Economic consumption and production are linked with issues surrounding well-being, such as climate change, resource depletion and the ability to assimilate waste (Tribe, 2011). According to environmental economics, the economic benefits of tourism should be understood and interpreted in the context of these environmental externalities, and the undesirable side effects on communities and the environment.

A green economic system requires different approaches and alternative measures for defining and monitoring 'progress', which move beyond GDP and isolated economic measures and incorporate environmental externalities. Methods are required which account for current and future well-being and sustainability, and include a range of indicators or ‘balance sheets’ which include environmental indicators, such as greenhouse gas emissions and the use of natural resources, but also consider areas such as technology capacity and social capital (Costanza et al., 2009; Stiglitz, Sen and Fitoussi, 2008).

Alternative indices have, nevertheless, been developed to try to consider the outcomes of economic activity rather than just increases in the economic activity itself. These include the Index of Sustainable Economic Welfare (Jackson, McBride, Marks, and Abdallah, 2007), Happy Planet Index (Marks, Abdallah, Simms and Thompson, 2006; Marks, 2012), Global Green Economy Index (Tamanini, 2014), and the Genuine Progress Indicator (Talberth, Cobb and Slattery, 2007). All of these include an indicator for carbon emissions. These measurement approaches challenge established progress measures and are being considered as alternatives to GDP, for example by the European Parliament (Goossens and Mäkipää, 2007). These indices have not become mainstream, nor do they appear to have been applied to tourism; however, indicators that take social and environmental costs into account, like the Ecological Footprint (Hunter and Shaw, 2005), or suites of sustainability indicators such as the European Tourism Indicator System (European Commission, 2013), have been applied to tourism, but do not necessarily incorporate carbon emissions as a measure.

As with GDP and all other indicators, issues linked to data availability, accuracy, level of detail, and scope exist. Beyond technical challenges, it is also likely that challenging the paradigm of economic growth is difficult, especially where results illustrate poor performance and erode industry and political support (Costanza et al., 2009). Measuring environmental externalities such as carbon emissions can therefore be problematic, especially if the results are seen to be ‘negative,’ as there is no real incentive for the tourism sector to reduce impact unless a 'cost' is assigned. However, it is in the tourism industry's 'self-interest' to value, manage and protect the climate and natural environment (IUCN, 2015; Williams and Ponsford, 2009). The theoretical argument has to be turned into practical actions which can substantiate claims, working to address present contradictions between commercial imperatives (businesses, investors, governments, taxes) and destroying the environmental foundation upon which the industry relies (Yasarata, Altinay, Burns, and Okumus, 2010). Unfortunately, despite the multitude of environmental agencies, programmes and international summits (e.g. Rio +20[7]), there is no global environmental governance system (Pelletier, 2010). For natural capital to be maintained and not continuously eroded, the thresholds and capacities have to be understood and recognised, alongside natural absorption/resilience capabilities (Weaver, 2012).

2.2.3 Climate Change Mitigation

The challenge of quantifying human-induced emissions is not just a recent concern, and dates back to the 1800's. Högbom (1895) tried to quantify the global carbon cycle and estimate emissions from the use of fossil fuels, and Arrhenius (1896) estimated that a doubling of atmospheric greenhouse gases could lead to long-term warming of the global climate. Society is now presented with Arrhenius's predicted challenge, and to avoid a change in climate that is considered dangerous (a rise over 2^0C from pre-industrial levels), global emissions need to decline (IPCC, 2007; UNFCCC, 1998). Despite some continued climate change scepticism and political resistance (Kolk and Levy, 2001; Morgan and McCrystal, 2009), there is increasing scientific consensus surrounding human-induced climate change. Research on climate mitigation is growing rapidly and has moved beyond cause and effect to include: assessment and measurement; economics; the social and political

[7] United Nations Conference on Sustainable Development held in 2012, also known as the Rio Earth Summit

dimensions; psychological and cultural implications; and the role of media, information and communications technology (Griggs and Kestin, 2011).

In terms of consensus on action, the 1997 Kyoto Protocol was an international treaty which extended the 1992 United Nations Framework Convention on Climate Change (UNFCCC, 1998). It committed State Parties to legally binding emission reduction commitments with the objective to stabilise greenhouse gas concentrations in the atmosphere, at a level which will prevent a rise over 2^0C (UNFCCC, 1998). The United Nations Climate Change Conference in Cancun, Mexico in 2010 (Conference of the Parties (COP) 16) called for countries to list under the UNFCCC their collective emission reduction targets, strategies and actions, described as the "largest mitigation effort the world has ever seen" and required annual reporting through a system of mutual accountability (UNFCCC, 2010, webpage). However, the UN estimated that even if targets were implemented, they would deliver only 60% of the emission reductions required to stay below the 2^0C rise in average temperatures and 2^0C does not guarantee that detrimental impacts will not occur (UNFCCC, 2010).

The 2011 UN Climate Change Conference (CoP 17, Durban) led to the "Durban Platform" agreement to develop a legally binding treaty to reduce emissions, to be defined by 2015 and become effective in 2020. For the first time this included the United States and developing countries such as India and China. The first commitment period for the Kyoto Protocol expired in 2012 and the second commitment period from 2013-2020 known as the Doha Amendment is now in force, with 53 countries that have ratified (UNFCCC, 2015). Carbon accounting and reporting at the national level is mandatory for all UN parties (UNFCCC, 1992, Article 4.1a), using the Guidelines for National Greenhouse Gas Inventories (IPCC, 1996). This measurement, alongside the quantitative targets set out in international climate change agreements such as Kyoto, assigns responsibility for action and is politically significant (Miller, 2004).

The UK's Climate Change Act (Crown, 2008) provided the world's first legal framework for reducing emissions, setting a binding emission reduction target of 80% by 2050. The framework set out a series of budgets, with the first requiring the UK to cut emissions by 34% by 2020 (from a 1990 baseline). Taking into consideration the cuts achieved to 2008, the UK Low Carbon Transition Plan (Crown, 2009a) set a target of 18% reduction on 2008 levels by 2020 and sets out how the UK will reach this target from the main emitting sectors of power, homes, workplaces, transport and agriculture. Targets have also been set to reduce emissions in specific sectors, for example the average new car to emit 40% less carbon and 40% of electricity to be from low-carbon sources (Crown, 2009a). These targets and the associated carbon reduction strategies such as the Renewable Energy Strategy (DECC, 2009), the Carbon Reduction Strategy for Transport (Department for Transport, 2009) and the Low Carbon Industrial Strategy (Crown, 2009b), may start to impact directly or indirectly on tourism's footprint.

Policy instruments have emerged to drive reductions in emissions, such as the Carbon Reduction Commitment which came into force in April 2010 and applied mandatory emissions trading to cut carbon emissions from large commercial and public sector organisations. This led to obligations and emissions reporting requirements being extended to industries with large point sources[8], for example the European Union Emissions Trading Scheme (EU ETS) (European Commission, 2003). In addition, opportunities have been developed through incentives such as

[8] A point source is an emission source at a known location. Emissions from large point sources across the UK may be either collectively responsible for the full national total emission for that sector (such as coal-fired power stations where the sector is made up of large operational facilities for which emission reporting is mandatory) or in part (such as combustion in industry, for which only the large sites within the sector are required to report emissions). Source: National Atmospheric Emissions Inventory

the Feed in Tariff and the Renewable Heat Incentive. However, for all of these, it is not clear how tourism's emissions have or will be affected.

2.3 Low-Carbon Tourism

Figure 2.2 summaries the key milestones which have linked the tourism development to sustainability and the need to reduce the industry's environmental impact. The first International Conference on Climate Change and Tourism was held in Djerba, Tunisia in 2003 to raise awareness within the international tourism community about the implications of climate change and inter-linkages between the two (UNWTO, 2003). The second International Conference on Climate Change and Tourism held in 2007 resulted in the Davos Declaration, which urged the sector to "progressively reduce its greenhouse gas emissions" (UNWTO, 2007, P2). The conference led to a range of outcomes including the aim to reduce the carbon footprint of the tourism sector.

Figure 2.2: Tourism from Rio 92 to Rio+20

Source: UNWTO, 2012b, slide 14.
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The dispersed nature of travel and tourism and the national and international nature of business need to be understood and addressed in order to assign responsibility for emissions appropriately. Travel is intrinsically linked to tourism and carbon emissions, yet often fails to appear as a part of tourism policy, strategies or management plans. Arguably ignoring the travel component will be to tourism's detriment (Tribe, 2011). The general public are poorly informed about the impacts of transport options, requiring improved information on the carbon footprint of transport and holiday choices and stronger relationships between those responsible for destination management, travel provision and promotion (Becken and Hay, 2007; McKercher et al., 2010). Gössling (2011) identified the challenges of socio-economic and 'status' drivers for tourism alongside the common belief that personal mobility is a 'right', and argued that systemic restructuring was essential to control tourism's emissions.

Tourists and visitors are core actors in tourism development processes (Moscardo, 2011) but increased consumer awareness of climate change and environmental constraints does not appear to influence visitor behaviour (Barr, Gilg and Shaw, 2011; Hares, Dickinson and Wilkes, 2010; McKercher et al., 2010). Research has shown that tourists expect good environmental management to be routine (Mair and Jago, 2010) and seldom select sustainable or eco-friendly products (Budeanu, 2007). With little consumer pressure or demand on the industry to respond, visitor numbers and associated emissions continue to increase, forming a critical carbon challenge.

Increased tourism numbers are likely to be due to rising affluence, income and expectations, similar to observations with vehicle ownership (Dargay, Gately, and Sommer, 2007), especially from emerging economies where tourism is now possible and accessible. For example, Airbus forecasts global air passenger growth to be 4.8% per annum over the next 20 years, with greater growth expected from emerging economies (Airbus, 2011). While fuel-burn efficiency and aircraft loading rates have led to an apparent 70% emission reduction in the last 40 years (per flight), this has not kept up with the nine-fold increase in visitor numbers (Airbus, 2011; Milne and Grubnic, 2011). Even though efficiency improvements may continue, they are unlikely to keep pace with forecasted growth.

Whilst governments and tourism bodies and associations do not appear to be taking a strong lead, some key industry players are undertaking carbon accounting and setting their own targets. For example, despite the exclusion of aviation from national carbon accounting schemes, in June 2009 the International Air Transport Association (IATA[9]) committed to stop the growth of their emissions from 2020 and to halve emissions by 2050, compared to 2005 levels in line with the WTTC (2009) target. To support the achievement of these targets, a four pillar strategy was developed to mitigate greenhouse gas emissions from aviation through 'improved technology', 'effective operations', 'efficient infrastructure' and 'positive economic measures' (IATA, 2009). In addition, the UNWTO declaration regarding the mitigation of greenhouse gas emissions from air passenger transport was issued to reiterate the general principles covered at Davos, but also recognised that air transport comprised 40% of the sector's emissions (UNWTO, 2010).

2.3.1 Governance of tourism in England

In examining the propensity for low-carbon tourism in England, with a specific focus on tourist destinations within the South West, it is important to understand the strategic and relational context for climate change and tourism management in the UK. The UK Government, through the Department of Culture, Media and Sport (DCMS), sets tourism strategy, policy and objectives for the national tourist boards for Britain (VisitBritain) and England (VisitEngland), and provides public funding. Public funding to VisitBritain and VisitEngland collectively amounted to £52.1 million in 2014/15 and is expected to rise to £60.5 million in 2015/16 (DCMS, 2015).

[9] International Air Transport Association - Trade association of the world's 250 airlines founded in 1945

In addition, local authorities in England provided a further £85 billion funding for tourism in 2014/15 (DCMS, 2015). The Government's tourism policy (DCMS, 2011) sets out three key aims:

1. fund the most ambitious marketing campaign ever to attract visitors to the UK in the years following 2012;
2. increase the proportion of UK residents who holiday in the UK to match those who holiday abroad each year;
3. improve the sector's productivity to become one of the top 5 most efficient and competitive visitor economies in the world.

VisitEngland is responsible for: developing the English tourism sector; leading the implementation of the strategic framework for tourism in England; promoting and marketing holidays in England; managing the regional growth fund for tourism; and managing tourism accreditation and assessment schemes (DCMS, 2015). The overall goal of VisitEngland is to increase the "propensity for domestic and international visitors to take breaks, holidays and day trips, resulting in increased consumer spending" (EnjoyEngland, 2010, webpage). The VisitEngland Strategic Framework for Tourism 2010-2020 sets out a headline ambition of 3% (5% including inflation) growth in value, year on year, to 2020 (VisitEngland, 2011), based on forecasts prepared by Deloitte (2010). This annual 5% growth target to 2020 provides the framework and drives the visions of the subsequent action plans.

Table 2.1 identifies the count of climate terms and describes the coverage of climate mitigation in key tourism documents. This revealed only one reference to managing the sector's carbon emissions in the Strategic Framework: "Tourism brings positive economic benefits along with the potential for negative social and environmental impacts. The industry faces a political imperative to manage carbon output and therefore must manage to grow the visitor economy within limitations that are increasingly challenging, while making the experience appealing to visitors" (VisitEngland, 2011, p8).

Table 2.1: Mapping climate terms in strategic national tourism documents

Strategy/Plan	Word Count of Search Terms	Description of Coverage
England: A Strategic Framework for Tourism 2010-2020 (VisitEngland, 2011)	Carbon: 1 Climate Change: 0 Mitigation: 0 Emissions:0 Greenhouse:0 CO_2: 0	Sustainability included and recognises the industry faces a political imperative to manage carbon output and therefore must manage to grow the visitor economy within limitations that are increasingly challenging while making the experience appealing to visitors. However, nothing further is mentioned or covered.
England: A Strategic Action Plan for Tourism 2010-2020 (VisitEngland, 2010)	Carbon: 1 Climate Change: 0 Mitigation: 0 Emissions:0 Greenhouse:0 CO_2: 0	Sustainability is mentioned once and recognises the industry faces the challenge of growing the visitor economy within limitations that are increasingly challenging (for example, a political imperative to reduce *carbon* outputs) whilst ensuring the experience remains appealing to visitors. There is a commitment to develop a Sustainable Tourism Action Plan (*Wise Growth Action Plan below*).
England: Wise Growth Action Plan (VisitEngland, 2011a)	Carbon: 3 Climate Change: 2 Mitigation: 0 Emissions:2 Greenhouse:0 CO_2: 0	There is an action to evaluate the effectiveness of 'foot printing' tools in order to complete a life cycle analysis of different visitor types to and within England. Outcomes include a greater understanding of the potential business case for holidaying at home to achieve carbon reduction and a reduction in carbon emissions and lower energy consumption at a business level. It is also mentioned that there is the potential for reduced emissions through fewer food distribution miles. However it is not clear how these will be put into action or what the links are to the core Strategic Framework and other action plans.
England: Destination Management Action Plan (VisitEngland, 2011b)	Carbon: 0 Climate Change: 0 Mitigation: 0 Emissions:0 Greenhouse:0 CO_2: 0	An objective is to increase understanding among decision makers and stakeholders of the economic, social and environmental value of effective destination management. However, the terms environment and sustainability are mentioned a few times, and primarily in relation to economic returns and sustaining the tourism economy. Environmental management appears absent.
England: Tourism and Transport Action Plan (VisitEngland, 2011c)	Carbon: 3 Climate Change: 1 Mitigation: 0 Emissions:0 Greenhouse:0 CO_2: 1	Primarily about improving the ability for visitors to reach their destinations and overcoming transport issues that act as a barrier to tourism growth. Mentions low-carbon technology and covers sustainable transport options in relation to domestic travel, but not in relation to air travel and international visitors where references are around expanding routes and airport capacity. Links are made to the Wise Growth Action Plan and to DMOs, yet nothing is tracked into the Destination Management Action Plan.
DCMS Business Plan 2011-2015 (DCMS, 2010)	Carbon: 0 Climate Change: 0 Mitigation: 0 Emissions:0 Greenhouse:0 CO_2: 0	Contents include priorities, actions, milestones, input and impact indicators but no mention of environment, climate change or carbon. References to sustainability appear to be only about economics and growth.
Britain Marketing and 2012 Games Global Strategy 2010-2013 (VisitBritain, 2010)	Carbon: 0 Climate Change: 0 Mitigation: 0 Emissions:1 Greenhouse:0 CO_2: 0	Recognises the need to develop policy which addresses global competitiveness issues such as sustainability (appears to be an economic focus). No mention of climate change or carbon. Emissions' trading is identified as a challenge for travel to the UK. Suggests the need to measure against a broader set of metrics but there is no social/environmental coverage.

Source: Author

There is no further mention within the framework and as Table 2.1 indicates there is limited detail in some of the key action plans. The aim of VisitEngland's Wise Growth Action Plan (VisitEngland, 2011a) was to grow tourism responsibly in a finite world and to balance growth aspirations with the principles of sustainability. This plan provided an opportunity for clarity and commitment on climate mitigation. Although carbon emissions were mentioned three times, it appeared only to be where an economic benefit was apparent – for example, businesses saving energy and creating a substantiated case for holidaying at home (Table 2.1). The plan identified the need to improve measurement and recognised the tendency to "value the measurable" (i.e. numbers in schemes), rather than "measuring the valuable" (i.e. impact). Action 4.2 commits to evaluating the effectiveness of footprinting tools to analyse the life cycle of different visitor types (VisitEngland, 2011a, p1). However, it is not apparent if any action has been undertaken and covering carbon as a discrete element in a separate plan limits the ability to influence core tourism policy and strategy.

The national tourism planning perspective is primarily about gaining return on investments and increasing visitor numbers, with little if any mention or measures relating to climate change or emissions reduction. However, *Winning: A tourism strategy for 2012 and beyond* (DCMS, 2007) that specifically focussed on London and the 2012 Games identified climate change as an important issue, but it was suggested that it should not be tackled as a standalone subject within a new framework (DCMS, 2007). It would thus appear that low-carbon tourism is a rhetorical term, rather than a clear commitment to change, because carbon mitigation fails to manifest itself in core tourism policy where 'business as usual' growth dominates. Substantial gaps remain between the discourses and uncertainty seems to prevail in terms of the seriousness, consequences and action to prevent interference with the climate system (Gössling and Peeters, 2007).

Although engagement from aspects of the tourism sector is evident, it is limited and raises questions about the ability and willingness of the tourism industry and tourists to reduce emissions (Scott and Becken, 2010; Miller, Rathouse, Scarles, Holmes and Tribe, 2010). This could be due to tourism playing a minor role in international climate negotiations, weak policy regimes, and the absence of 'climate' measures in core tourism strategy and decision making criteria (Scott and Becken, 2010). If covered at all, climate change is treated as a satellite concern, with separate plans or initiatives, rather than integration into core elements of tourism strategy, such as marketing, quality standards and training. The associated measures and targets also remain limited.

However, there appears to be an increasing amount of corporate business activity (all industries) when it comes to climate mitigation programmes, initiatives and measures (Levy and Newell, 2000; Kolk and Levy, 2001; Kolk and Pinkse, 2005; Hoffman and Glancy, 2006). These include carbon market trading, carbon offsetting and carbon neutral goals (Pinkse and Kolk, 2009; Milne and Grubnic, 2011). Research into the climate change strategies and practice of FTSE 100 companies (Okereke, 2007), revealed that companies are now engaging in a wide range of emissions reduction activities which include consideration of product versus process, direct versus indirect emissions, radical versus incremental reduction, internal versus external environment, and innovation versus compensation (Kolk and Pinkse, 2005; Hoffman and Glancy, 2006). However, the increasing interest for corporate carbon management requires consistent carbon accounting mechanisms and inventories.

2.3.2 Low-Carbon Destination Management

Tourism organisation, planning and management can exist at various scales from the international, national, regional, local and site levels, and the boundaries are often perceptual rather than real. Dwyer and Kim (2003) suggest that the control and responsibilities for each level should be clearly identified and a system for accountability implemented. Wang (2011) identifies four models for tourism management representing different funding and governance structures; government agencies, government-funded non-profit organisations, dual-funded non-profit organisations and members-only trade associations. All these structures work to promote tourism objectives within a destination, and the purpose and the way the organisation is ‘chartered’ will influence its leadership, vision and priorities, policy direction, approach to tourism planning and level of accountability (Wang, 2011). Pike (2008) identifies three distinctive types of tourism organisations, those that are responsible for promotion; those that are providing policy advice to government; and private sector associations which represent and respond to industry needs.

The term ‘destination’ is nebulous and a standard definition has proven difficult. Using a systems approach which considers visitor consumption patterns, it can be argued that a destination is a geographical space in which a cluster of tourism resources exists, rather than a political boundary (Pike, 2008). Often, however, tourism management organisations reflect administrative boundaries, in part due to funding arrangements and alignment to existing management and governance structures (e.g. protected landscapes, national park or local authority). To complicate matters further, the tourism product at the destination level is a combination of goods and services, produced and delivered by a range of actors and enterprises, each acting more or less autonomously, with little consideration for the needs and activities of other enterprises (Wang and Pizam, 2011).

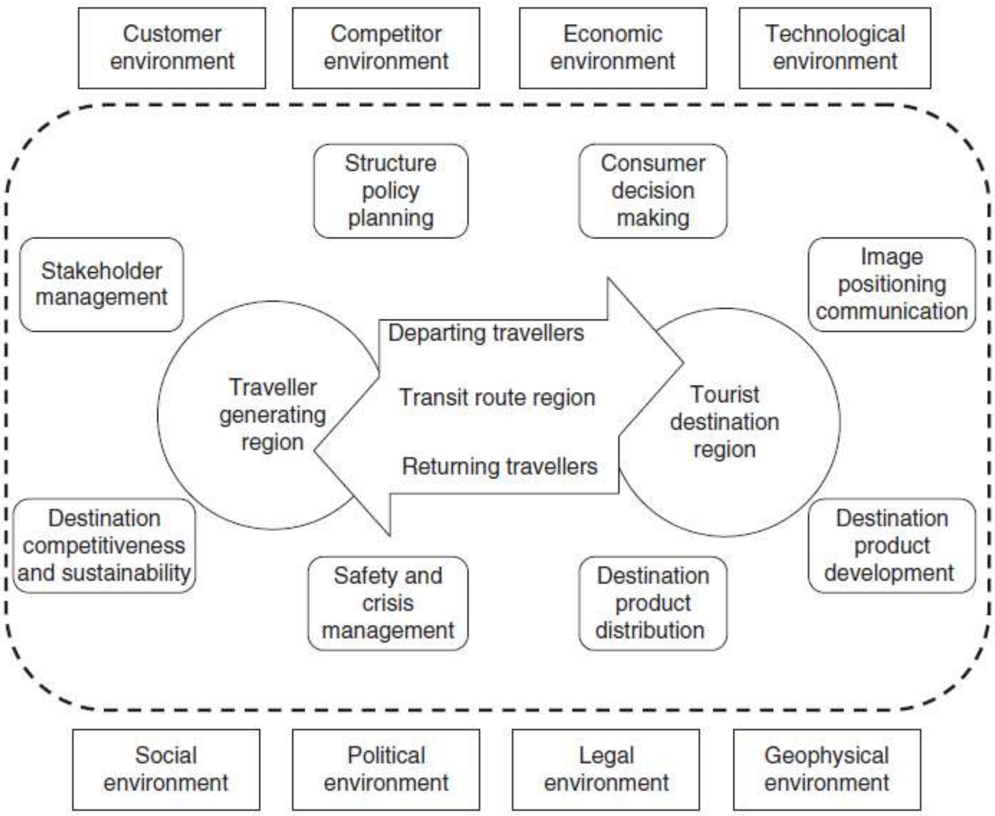
At a destination level, ‘umbrella’ tourism organisations in the UK are often referred to as Destination Management Organisations (DMOs) although the acronym has different interpretations, with the ‘M’ denoting either marketing or management. For example, Wang (2011, p6) defines a DMO as a Destination *Marketing* Organisation, the "organisation responsible for the marketing of an identifiable destination". On the other hand, DMOs are described as Destination *Management* Organisations (Dwyer and Kim, 2003) and are defined by Buhalis (2000, p108) as having "overall responsibility for the entire destination product and through incentives and policies facilitate the development of products, and create local partnerships for the delivery of seamless experiences".

Increasingly, destination marketing organisations have developed their role to take on wider management duties. Wang (2011) describes these as Destination Management and Marketing Organisations (DMMOs). Although there is recognition that the role of a Destination Marketing Organisation should include other important activities, increasing visitors and marketing remains the principal functions and few manage beyond promotion unless a crisis is evident (Ritchie and Crouch, 2003; Butler, 2010; Richardson and Fluker, 2008).

Another major challenge is that DMOs have limited influence or absolute control over the production, quality, attributes, pricing, promotion, and delivery of tourism products and services (Wang and Pizam, 2011). There is also limited scope to influence visitor experiences and satisfaction at the destination. This is mainly due to the disaggregated nature of the sector and conflicts of understanding between private sector producers and public sector marketers and managers. Leiper (2004) developed a model to conceptualise the tourism system and described three main elements, the region of origin (market), the tourist destination region and the transit region (transport). The model also recognises natural resources and industrial and non-industrial elements, providing a more comprehensive understanding of the system. This systems approach is crucial when looking at environmental impacts, since focussing exclusively on the destination means that the region of origin and transit are ignored and the full impacts and pressing environmental problems cannot be understood (Peeters, 2012). This is an important consideration when the scope is being defined for the carbon footprint (see section 3.3.2).

Eight ‘super trends’ or external environmental drivers for destination marketing and management have been identified in a report of the 2008 Future Studies; customer, competitor, economic, technological, social, political, legal and geophysical (DMAI, 2008, p46-48). Wang (2011) has utilised these themes and Leiper's tourism system model to develop a framework for destination marketing and management as presented in Figure 2.3

Figure 2.3: Framework for destination marketing and management



Source: Wang and Pizam, 2011, Figure 1.1, p6.
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Conceptually, Wang's (2011) framework provides a useful base to consider marketing and management activities and how destinations may operate, and to consider the opportunities for integrating emissions reduction. Each of the eight macro-level environmental changes pose both challenges and opportunities for tourism and climate mitigation. Creative thinking across the framework can encourage innovation and impact on the philosophy, customs, practice, strategy and principles of destination organisations (DMAI, 2008). Tourism destinations, like products, are also described as having a lifecycle, described in Butler's (1980) Tourism Area Life Cycle (TALC) model as six life-cycle stages of exploration, involvement, development, consolidation and stagnation, followed by either rejuvenation or decline. Butler (2004) identified many similarities between the concept of sustainability and the TALC model. Of particular relevance to the low-carbon agenda is the need for stabilisation of tourism growth when carrying capacity[10] is reached and the need to apply limits[11] if a sustainable state is to be achieved (Butler, 2010).

2.3.3 Motivations, Drivers and Barriers to Carbon Management

In terms of international action on climate change, two noticeable shifts can be seen in the position of corporate actors: a move from opposition towards a more cooperative approach; and companies moving from influencing policy debates to pursuing practical action within the framework of a corporate climate strategy (Okereke, 2007). Tension nevertheless remains over the compatibility of environmental concerns and business interests. From a theoretical and practical perspective, this depends on whether the climate activity is the subject of 'corporate social responsibility' (ethics) or 'strategic business management' (economics) (Hoffman and Glancy, 2006; Okereke, 2007). If pursued from a genuine sense of

[10] The maximum population size that the environment can sustain indefinitely
[11] The safe environmental threshold, boundary or tipping point

responsibility over economic rationality, it is suggested that the impact of climate activity to reduce emissions is greater (Le Menestrel and de Bettignies, 2002).

Okereke (2007, p477) also argues that to make progress towards a low-carbon or carbon neutral economy, it is critical that climate change is incorporated as an "explicit aspect of strategic business management and as an endogenous component of the business model". It would appear that profit is a motivation but it requires an ethical rationale, which responds to economic motivations (profit and comparative advantage), drivers (wider societal and environmental pressures and concerns) and barriers, to incorporate carbon management into corporate systems (Okereke, 2007).

Businesses reporting on carbon management find it good for business, with proactive companies wanting to mainstream it into their strategy and core operations (Okereke, 2007). However, environmental considerations in tourism are often confined to public relations, legal compliance, political manoeuvring and marketing (Hall, 2010; Lane, 2009; Weaver, 2009; Buckley, 2009). As low-emission products, services and technologies replace carbon-intensive ones, competitive risk may drive carbon management more than carbon markets and carbon taxes (Kolk, Levy, and Pinkse, 2008). For example, rising oil prices are leading to rising travel and business costs (Schiff and Becken, 2011) and it is suggested that the resulting market changes are far more likely to influence business climate action than any concern for the environment (Evans, 2005). This, alongside negative publicity, presents opportunities for product innovation and to create market differentiation and advantage (Miller, 2001). The use of low-carbon as a competitive driver for tourism nevertheless needs to be mindful of the criticisms of sustainable tourism: that it can be manipulated and misused as a marketing ploy and public relations tool (Mowforth and Munt, 2009) and one should be careful not to "provide corporations ethically more appealing wrapping paper for the same old toy" (Lansing and De Vries, 2007, p77).

Carbon mitigation can be achieved through various mechanisms: economic measures, technological improvements, behavioural change, policy and strategic planning (UNWTO, 2007); and these approaches could be applied at the destination level. Aall (2011) identifies three approaches to attain more sustainable consumption: to increase efficiency, change consumption patterns or reduce consumption volume. The role of tourism as an educational arena to encourage better practice and low carbon lifestyles is also proposed. These approaches to sustainable consumption could be used as a basis to explore, analyse and identify low-carbon challenges and opportunities at the destination level, and to investigate why current tourism governance arrangements seem to preclude opportunities to manage or control the high-carbon nature of the tourism system.

2.4 Emissions Accounting in Tourism

Responsibility for collating tourism statistics in the UK is undertaken by the devolved administrations and the English Tourism Intelligence Partnership (now ETRIP), which was set up to implement the Allnutt Review recommendations (Allnutt, 2004) and examine improvements in tourism statistics. The Tourism Intelligence Unit (TIU) within the Office for National Statistics (ONS) was set up in 2008 to respond to its recommendations, especially those relating to tourism industries, the visitor economy and the economic impact of tourism (White, 2012). The TIU is currently funded by VisitEngland and VisitWales.

Regional areas, destinations and tourism bodies/associations also undertake their own research, but Key Performance Indicators (KPIs) consistently reflect the strategic focus on marketing and 'growth' in visitor numbers and annual expenditure. The review of literature suggests that little work has been done nationally to account for the environmental impact and greenhouse gas emissions of tourism in the UK. This is supported by a TIU review of sustainable tourism indicators, which included a request from the Sustainable Tourism Action Group (STAG) to assess the effectiveness of environmental footprint tools (ONS, 2011), including REAP Tourism (described in section 3.3.1). From the review of recent UK literature, it would appear that there is no further mention or reference to this commitment. At the time of writing, national measurement and reporting of energy consumption and/or the emissions impact of the tourism sector is non-existent in the UK.

Prior to the formation of VisitEngland, the English Tourism Council provided strategic advice and direction for the industry and in 2001 published a set of 20 national sustainable tourism indicators (English Tourism Council, 2001), which included one on carbon emissions (CO_2). This appears to have been ahead of its time in relation to carbon measurement in tourism, and unfortunately was short-lived due to changes in the administration, leading to only one published progress report. Delivering a reduction in carbon requires investment of time, resources, and innovation across the tourism sector.

Despite the lack of activity at the national level, some regional tourism bodies in England have recognised that climate change is a relevant issue, from both adaptation and mitigation perspectives. For example, the challenges and opportunities of climate change ‘impacts’ for the visitor economy were investigated for the North West of England (McEvoy, Cavan, Handley, McMorrow, and Lindley, 2008), and a national case study looking at the potential implications of climate projections for tourism was undertaken in the South West of England (Whittlesea and Amelung, 2013). The South West also promoted an overarching commitment to sustainable low-carbon tourism growth (South West Tourism Alliance, 2011), proposed a core carbon emissions indicator alongside visitor expenditure, and set an emissions reduction target for tourism to support the national 2020 target set out in the Climate Change Act (Crown, 2008).

This was progressive, but also unfortunate timing as it coincided with the abolition of regional government and the South West regional tourist board which developed the plan and would have been responsible for implementation. It is worth noting, however, that tourism plans are often prepared, but may not be implemented as intended (Burns, 2004). This can be due to: complexity; unrealistic expectations of coordination; cooperation and commitment from all parties; an impractical nature; lack of financial viability; and disconnection from destinations' institutional arrangements (Hall, 2008). These challenges are likely to be even more evident for a low-carbon tourism plan. In addition, those responsible for delivery would still have to contend with limited leverage and control over the industry, and balancing the needs of the supply oriented resource-based approach of the public sector and the market-oriented approach of the private sector (Yasarata, et al., 2010). That aside, it is suggested that the greatest opportunity to mitigate the negative impacts of tourism is at the local level, in part due to local government having considerable control over tourism development in the area (Hall, Jenkins and Kearsley, 1997). Despite this opportunity, tourism is not adequately managed at the local destination level and there is little application of the principles of sustainable development (Ruhanen, 2007).

2.4.1 Counting and accounting for carbon

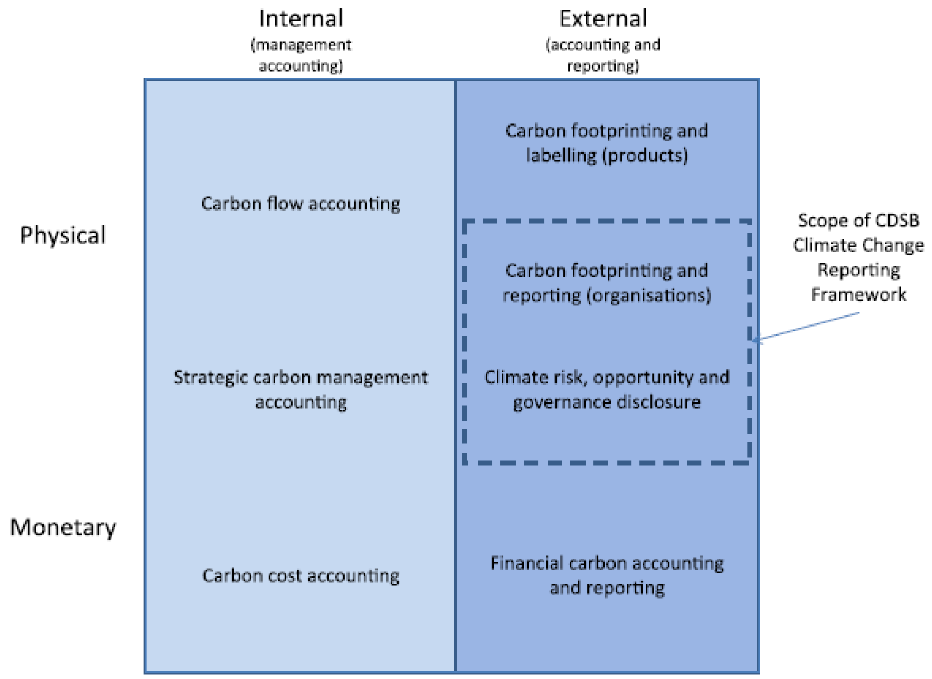
Measuring greenhouse gas emissions is an emerging field of scientific enquiry, but is complex and highly challenging as researchers delve deeper into societal systems and natural processes. The core issues are tensions between accuracy, consistency and certainty, within and across organisational fields, each with different goals (Bowen and Wittneben, 2011). The main challenges are as follows. First, carbon accounting is a social construct that can help examine carbon performance, but accounting does not necessarily lead to reduced emissions (Biondi and Suzuki, 2007; Bowen and Wittneben, 2011). Second, it is often difficult to link carbon accounting to emissions reductions, as data are often reported in isolation and/or in qualitative ways. This can lead to inconsistent reporting, which is contrary to the base aim of transparency and facilitating accountability. Ultimately, Bowen and Wittneben (2011) argue that measurement should be about mitigation and achieving 'absolute' emissions reductions. Third, it is often technically impossible to count carbon fully or accurately due to the complexity of the natural and human systems involved. This uncertainty should, nevertheless, not prevent action based on estimates, as carbon accounting methodologies have developed considerably over time and are expected to continue to improve, with higher accuracy and lower uncertainty (Bowen and Wittneben, 2011).

Accounting for carbon emissions can help to improve energy and material flows to reduce consumption and increase eco-efficiency[12], innovation and legitimacy (Schaltegger and Csutora, 2012). Carbon accounting can incorporate monetary and non-monetary aspects, can have internal or external applications, can be mandatory or voluntary, can be full or partial and is a term used in many disciplines and at different scales; national, project, organisation and product (Stechemesser and Guenther, 2012). Carbon accounting has been defined as "the recognition, the non-monetary and monetary evaluation and the monitoring of greenhouse gas emissions on all levels of the value chain and the recognition, evaluation and monitoring of the effects of these emissions on the carbon cycle of ecosystems" (Stechemesser and Guenther, 2012, p36).

[12] Eco-efficiency combines ecological and economic performance measures and has been proposed as a management tool towards sustainable development (Yu et al., 2013)

Figure 2.4 provides examples of carbon accounting which considers physical and monetary dimensions and internal and external purposes.

Figure 2.4: Types of carbon accounting



Source: Ascui and Lovell, 2012, Figure 1, p57
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Global frameworks for greenhouse gas reporting are now well developed. For example, the World Resources Institute (WRI) and World Business Council on Sustainable Development (WBCSD) developed the standardised Greenhouse Gas Protocol and supporting tools to help companies, organisations and more recently communities, to measure and report their greenhouse gas emissions (Fong et al., 2014). In addition, the Climate Disclosure Standards Board (CDSB) is an international consortium of businesses and environmental NGOs and produced the Climate Change Reporting Framework, aligning corporate reporting of natural capital with financial capital (CDSB, 2012). Deloitte and Price Waterhouse Coopers (2014), amongst others, also provide advice and support for carbon accounting and the International Accounting Standards Board (IASB) integrates carbon into accounting practices.

2.4.2 Carbon footprinting

The carbon ‘footprint’ is a descriptor for carbon impact which can be used at different scales (e.g. national, product etc.) and is defined by the Carbon Trust as “the total greenhouse gas emissions caused directly and indirectly by an individual, organisation, event or product” (Carbon Trust, 2012, p2), and should reflect all six Kyoto greenhouse gas emissions (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride). The normal unit of measurement used is carbon dioxide equivalent (CO_2e) to allow a like-for-like comparison to one unit of carbon dioxide (CO_2). The aim of carbon footprinting is to include the whole life cycle assessment of emissions (Weidema, Thrane, Christensen, Schmidt and Løkke, 2008) and refers to the consumer products and services consumed (Wiedmann et al., 2010; Minx et al., 2009). This life cycle approach goes beyond production and makes the link to individual and collective consumption and aligns with the approach utilised for water, waste and ecological footprint calculations. The ‘inventory’ or ‘accounting’ approach typically represents production, whereas the ‘carbon footprint’ perspective typically represents consumption and allows those industry sectors that are primarily responsible to be identified (Wood and Dey, 2009).

Despite the ‘carbon footprint’ becoming a commonly used term and measure for mitigating the effects of climate change, there is no commonly agreed scientific definition, accounting principles or methodology and modelling approach (Wiedmann and Minx, 2008). For example, the carbon footprint is often defined and used as a collective term for total greenhouse gas emissions (Carbon Trust, 2012), but from a scientific perspective this can be an inaccurate and confusing representation (Wiedmann and Minx, 2008). For this research, the carbon footprint refers to all ‘greenhouse gases’ (GHG, CO_2e) as so many studies and published documentation on the subject refer to this interpretation of the Carbon Footprint.

This is consistent with international and national emissions regulations and monitoring mechanisms for the carbon footprint that include all six Kyoto greenhouse gases (European Commission, 2003). A reference to only CO_2 reflects research that focussed specifically on carbon dioxide emissions. Table 2.2 provides a description and interpretation of the carbon footprint for clarity.

Table 2.2: Defining and describing the carbon footprint

Definition	The total amount of GHG emissions (CO_2, CH_4, N_2O, HFC, PFC, and SF_6) that are directly and indirectly caused over the full life cycle for a product, event, service, individual or organisation.
Approach	A consumption-based perspective (demand side) that complements the production-based accounting approach (supply side) taken by national GHG inventories (e.g. those considered by the Kyoto Protocol).
Data Sources	Includes national economic accounts (supply, use, input-output tables), international trade statistics (UN, OECD, GTAP and others), environmental accounts data on GHG emissions (IEA, GTAP, and others), data on population (World Bank, ONS), local data sources (can utilise bottom-up and top-down data).
Unit of Measurement	Kg or tonne of CO_2 when only CO_2 is included or CO_2-e when other GHGs are included as well. No conversion to an area unit takes place to avoid assumptions and uncertainties.
Indicator coverage	Multi-dimensional indicator that can be applied to products, processes, companies, industry sectors, individuals, governments, populations, etc. Documents all direct and indirect GHG emissions due to use of resources and products.
Policy Usefulness	Offers an alternative angle for policy on climate change and complements the approach used by the UNFCCC. Offers a different understanding of responsibility and could facilitate international cooperation and partnerships between developing and developed countries. Identifies alternative levers for reducing GHGs i.e. change in consumption behaviour. Helps to analyse the consequences of using alternative energies. Can help design an international harmonized price for greenhouse gas emissions. Illustrates the unequal distribution of energy use and can be used to design international policies aimed at implementing contraction and convergence principles. Can be benchmarked against 2050 targets for total global GHG emissions.
Similarities with other indicators	Assesses human pressure on the planet from a consumer-based angle, so similar to water and ecological footprint indicators. Uses a consumer based approach to track human pressures on the environment in terms of total GHG emissions and human contribution to climate change.

Source: Author, developed from Galli et al., 2012 and Wiedmann and Minx, 2008

2.4.3 Setting the footprint boundary

The open and complex nature of tourism means it is crucial to define the boundaries of impact and Gössling (2009) reiterates the importance of transparency when describing system boundaries, as boundary changes can play as much a part in the quantity of emissions as carbon reduction strategies. A crucial first step is to determine the scope of the emissions to be measured and their sources. The first challenge, therefore, is the clarification and construction of the ‘carbon footprint’ in order to quantify a baseline.

2.4.3.1 Direct Versus Indirect Emissions

Early studies examined carbon dioxide generated from direct emissions (from energy used); however, more recent studies attempt to cover the wider range of emissions and also, where practicable, to account for indirect emissions (life-cycle perspective). This provides a more complete picture, since studies based only on CO_2 will significantly underestimate tourism’s emissions, especially because the impacts of non-carbon emissions from food production and aviation are regarded as substantial (Sausen et al., 2005). The coverage of the footprint can therefore vary from direct CO_2 emissions to full life-cycle greenhouse gas emissions (expressed as CO_2e). This could simply be related to the scope of studies, but is also related to the data and methods available.

The more comprehensive and resource intensive approach is to consider the full greenhouse gas emissions associated with all visitor activities, including indirect emissions released within the production supply chain of the product, goods or services consumed by visitors. This means that the sum of all the production stage emissions must be calculated and reallocated to the consumer if indirect emissions are taken into account.

If the footprint definition is to include both direct and indirect emissions, reflecting the life-cycle impacts of the tourist or tourism goods and services, questions arise as to where boundaries should be drawn and how the impact should be measured. This includes considerations of under-counting[13] and over-counting[14] which could become an increasing problem due to the lack of carbon footprinting guidance for the tourism sector, the cross cutting nature of the sector, and the multiple levels that measurement can occur (individual product to global industry).

2.4.3.2 'Tourism' Versus 'Tourist'

Another consideration for emissions accounting, is whether the research is interested in the emissions released from the production (*tourism industry perspective*) and/or consumption (*tourist perspective*) of tourism goods and services. The current global policy framework for reducing emissions (Kyoto Protocol) holds producers accountable through national greenhouse gas inventories that measure emissions released from the 'production' of goods and services. The problem with this methodology is where developed countries outsource production to cheaper and potentially less efficient countries (Galli et al., 2012). This reduces the accountable production-based carbon footprint even though the relative carbon impact is likely to increase, especially if the emissions of transporting the goods, services or products are taken into account (unless a border adjustment is applied).

Imported greenhouse gas emissions can account for 40% of a region's emissions (Andrew, Peters, and Lennox, 2009). For example, between 1990 and 2012 the European Union has estimated an 18% decrease in total greenhouse gas emissions, and a decrease in emissions per unit of GDP by 44% (European

[13] Recording less than the actual amount of emissions, through error, incomplete methods, or an attempt to falsify records.
[14] Recording higher than the actual amount of emissions, perhaps through error, methods or double counting emissions.

Environment Agency, 2015). On closer investigation, however, the reduction appears in part to be due to exporting industrial production and the increasing reliance on imports to meet resource needs (European Environment Agency, 2015). Globalisation has caused a shift in Europe's emissions from industry, which has seen a decrease, to transport, where there has been an increase (Schaltegger and Csutora, 2012). Increasing shares of emissions are imported and have been described as a 'carbon rucksack' (Weizsacker, Hargroves, Smith, Desha, and Stasinopoulos, 2009). Should this trend continue, emissions embodied in imports could exceed emissions of domestic production (Weber and Matthews, 2008). This will worsen if the CO_2 intensity of products increases, for example with increased transport distances.

The hidden imported share of greenhouse gases can be accounted for through consideration of product life cycles and supply chains (Schaltegger and Csutora, 2012). An alternative consumption-based approach reassigns responsibility and holds the consumer to account (i.e. the tourist), encompassing the impacts associated with the production of goods, services and products consumed (including imports). This approach complements the production-based approach and can help with policy and decision making processes, especially those concerned with the global distribution of resources, sustainable consumption, and consumer, industry and government awareness. This method could also facilitate fair international emission reduction commitments and co-operation between developed and developing countries (Galli et al., 2012; Peters, 2008; Lenzen, Murray, Sack and Wiedmann, 2007).

Measuring only the tourism sector's impact from a production perspective means that the services used by tourists and residents alike (e.g. transport, catering) would not be considered. Examining the consumption perspective of tourists would allow for a more complete examination of impacts for all services, activities and products consumed. This can cover, for example, food and consumer items, travel within the destination, and impacts on other public services that are often not accounted for.

Associated production impacts are accounted for in the consumption-based approach if it takes into account the full life-cycle. The production categories recognised within the tourism system at present are arguably narrow and typically would not include retail and public services (e.g. car parking, beach cleaning). The distinction centres mainly on attribution and responsibility; however, the consumption approach is naturally more comprehensive as it examines tourist consumption from a macro level and considers the impacts of a wide range of chosen products and services (Whittlesea and Owen, 2012). The consumption approach extends responsibility for carbon emissions beyond tourism businesses (producers) and relates emissions to how tourists consume (consumers).

Gössling et al. (2005) measure the eco-efficiency of the tourism sector in various locations and the comprehensive UNWTO, UNEP and WMO (2008) study attempts to measure global emissions from the tourism sector. Some difficulties associated with measuring the impact of tourism businesses are found in accounting for services used by both tourists and local residents, such as transport and car parking (Hunter, 2002) and recognising the impacts beyond the ‘destination’ which occur in the ‘source’ and ‘transit’ region. This issue is removed when impact is assigned to the visitors themselves and enables the impacts of different visitor consumption and behaviour to be explored, which is crucial for carbon mitigation and management.

Whittlesea and Owen (2012) developed a methodology and tool called REAP Tourism to measure the impact of ‘visitor activity’. The purpose was to aid destination managers to investigate and manage the impact of their tourism products and visitors to the destination. Some studies (Cole and Sinclair, 2002; Gössling, Borgström Hansson, Hörstmeier, and Saggel, 2002; Hunter, 2002; Becken and Patterson, 2006) recognised the importance of taking a visitor focus rather than an industry focus, but there is variation in the literature as to the scope required. Hunter and Shaw (2005) suggested that a calculation of net impact needed to be considered recognising that when visitors are abroad, they are not generating impact in their own country.

2.4.3.3 Defining visitor impact

The UK's Department for Culture, Media and Sport (DCMS, 1998) defines a visitor as anyone on an irregular visit to the region spending more than three hours. This means local residents can be day visitors, but if they are attending their regular place of work or making a regular shopping trip they are excluded. Overnight visitors are those staying overnight in the region in both paid for and free accommodation.

Early tourism impact studies assigned visitors an impact equal to that of residents in the host country or their country of origin (Cole and Sinclair, 2002; Patterson, Niccolucci and Bastianoni, 2007; Wackernagel and Rees, 1996). However, the limitations of this have been recognised: visitors have a unique set of behaviours and demands that are different to residents and their activities need to be measured separately (Hunter, 2002; Gössling et al., 2002). In attempting to measure the impacts associated with visitors, other studies measured the energy used by accommodation providers and tourist attractions (Becken and Simmons, 2002; Becken, Simmons, and Frampton, 2003), converting energy use into estimates of CO_2 (Becken, 2005; Dickinson, Robbins and Lumsdon, 2010) and CO_2e (Byrnes and Warnken, 2006; Gössling, 2002; Konan and Chan, 2010). A critical piece of research was the UNWTO, UNEP and WMO (2008) Climate

Change and Tourism report, which represented the first attempt to calculate global tourism emissions of CO_2 from three main sub-sectors (accommodation, activities and transportation) for 2005.

Choosing a consumption approach and CO_2e as the measure of impact goes beyond the scope of most visitor impact studies, where impact is often limited to the direct energy use of accommodation, activity providers and visitor travel (Becken and Patterson, 2006; Becken, 2005). Studies to date which account for a full CO_2e footprint of visitors and include food and consumer items include Konan and Chan's (2010) study in Hawaii, Jones' (2013) study in Wales, and Whittlesea and Owen's (2012) study in the South West of England. These studies highlight the significance of including these parameters.

Most footprint studies and models describe the impact of their given population over a year, but this can restrict investigations. Becken and Patterson (2006) compared the energy uses of visitor types in New Zealand and found that meaningful comparisons between visitor types is only possible when trip lengths are equivalent. Another consideration Cole and Sinclair (2002) highlight is the importance of considering the seasonal and climatic variation on emissions, for example, heating and cooling will increase emissions and weather influences consumption patterns.

There is much debate as to which activities and expenditures to include in the visitor footprint. Becken et al. (2003) argue for the exclusion of the impact of international air travel because other components of a holiday could become less significant. In later work discussing CO_2 assessments at the global scale, Becken and Patterson (2006) make the case for excluding air travel to reduce the risk of double counting[15] by choosing to draw a boundary of impact around national borders. Air travel is a contentious issue and was excluded from the Kyoto agreement. However, Phase 3 (2013-2020) of the EU Emissions Trading Scheme includes EU internal flights, but international flights are excluded. The exclusion of aviation from the carbon footprint would mean that the full impact of visitors travelling to the destination would not be assessed. Whittlesea and Owen (2012) argue that a region should include the international and domestic air travel impact of its visitors because the choice of destination and transport mode are issues where a region has some influence – particularly in the way it markets itself. In addition, radiative forcing should be taken into account for air travel (UNWTO, UNEP and WMO, 2008).

For inter-continental travel there is also some debate as to whether the full return journey should be included (Jones, 2013), or whether it should be divided between the host and source region. This is as much an issue of equity as it is around ‘double counting’. For example, richer nations are a significant source of tourists, so if the return journey is included, the full transit emissions cost would be borne by the destination region. For developing countries, this could seem inequitable and it also revisits the ‘production’ versus ‘consumption’ approach for carbon accounting. The ‘polluter pays’ principle may assign responsibility to the visitor or source region as the ‘consumer’, or it could be divided between the source and destination regions.

Defining other expenditures is even more problematic. For example, accommodation and tourist attraction impacts are an obvious part of visitor footprints, but arguably so are supermarket shopping or holiday products bought in the country of origin (Hunter, 2002). The approach undertaken by Whittlesea and

[15] If a consistent global accounting method is not determined and applied, trips by plane could be accounted for more than once.

Owen (2012) includes expenditure by visitors whilst at their destination. However, net impact, where reductions are made to account for a visitor's absence of impact in their home country, is not considered.

2.4.4 Review of carbon footprint methodologies

Early research in tourism examined the direct emissions of international air travel (Olsthoorn, 2001), international passenger air travel to New Zealand (Becken, 2002) and leisure tourists on a worldwide scale (Gössling, 2002). A few years later national tourism emission studies appeared in New Zealand (Patterson and McDonald, 2004; Becken and Patterson, 2006; Becken and Simmons, 2008; Howitt et al., 2010) and other nations such as Germany (Böhler, Grischkat, Haustein, and Hunecke, 2006), Italy (Gössling et al., 2005), France (Ceron and Dubois, 2007), Australia (Byrnes and Warnken, 2006; Dwyer, Forsyth, Spurr and Hoque, 2010), Wales (Jones and Munday, 2007), Sweden (Gössling and Hall, 2008), Canada (Jackson, Kotsovos and Morissette, 2008) and Switzerland (Perch-Nielsen, Sesartic and Stucki, 2010).

A wide range of approaches and methodologies have been used to explore the potential contribution of tourism and tourist activity to greenhouse gas emissions internationally, nationally, regionally and at smaller geographic and destination levels. Greenhouse gas emissions have also been investigated more specifically for different business and tourist types, for tourism products and specific activities such as events. Table 2.4 (on page 64) summarises various studies on tourism and emissions and indicates their geographical coverage and scale, the focus of the study, the footprint type, and the method employed to calculate the footprint. However, for some, it was hard to determine the methodological approach or detail.

The review of studies illustrates considerable variation in the scope of emissions, tourism system boundary, data used, the methodology employed, and the interpretation and presentation of the results. There appears to be no consistent or defined method to measure and quantify emissions for the tourism sector. However, generic standards and guidance are available for preparing greenhouse gas emissions inventories: for example the Greenhouse Gas Protocol[16]; ISO 14067[17] (carbon footprint of products); and ISO 14064 (greenhouse gas emissions inventories and verification)[18].

Despite these standards, methodological concerns have been raised regarding the system boundaries, and their completeness and robustness (Wiedmann and Minx, 2008; Finkbeiner, 2009). However, standards are clearly necessary as the methodological approach and rigour employed in tourism studies varies significantly, from simple multiplication, to complex matrix systems, as well as both 'bottom up' and 'top down' data collection methods. Approaches are primarily:

- simple bottom-up multiplication;
- the use of top-down input-output frameworks which integrate economic-environmental accounting;
- and use of bottom-up Life Cycle Analysis.

Table 2.3 broadly describes these three main methodological approaches, although they can be applied and interpreted in different ways. The majority of the tourism carbon footprint studies that were investigated appear to have employed a *bottom-up analytical* approach to formulate the footprint. This method is straightforward and easy to apply, using industry data with energy consumption and/or emissions coefficients to calculate the footprint. The data used can be a combination of local, regional and/or national, primary and secondary data.

[16] Developed by the World Resources Institute the Protocol sets the global standard for measurement, management and reporting of greenhouse gas emissions.
[17] The international standard for quantifying and communicating the carbon footprint of products.
[18] The international standard for quantifying and reporting greenhouse gas emissions and removals.

This approach was also used to develop a basic framework for The Travel Foundation[19] to encourage tourism destinations to calculate and reduce their carbon emissions (Dick Sisman and Associates, 2007).

Table 2.3: Methodologies employed for calculating carbon footprints

Methodology	Description and Considerations
Bottom-up Analysis	Bottom-up method that uses tourism industry and tourist data (can be combinations of local, regional and/or national, primary and secondary) combined with energy consumption and appropriate emission conversion factors. This utilises a straightforward multiplication method through equations to calculate the footprint. This can simplify the process but in doing so, detail and rigour can be lost.
Top-down Input-Output Analysis	Top down method that uses integrated economic-environmental accounting (e.g. using Tourism Satellite Accounts and extended environmental accounts) and/or step-wise methodology. Input-Output tables or frameworks are used for the economic accounts and are combined with environmental account data to establish estimates of environmental impact. Produces comprehensive and robust emission assessments of production and consumption activities. Accounts for all higher order impacts and can set the whole economic system as a boundary. Suits macro and meso level scales as the completeness comes at the expense of detail.
Life Cycle Analysis (LCA)	Bottom-up method to understand the environmental impacts of individual products from cradle to grave. Life Cycle Analysis has clear advantages for looking at the micro level, for example a particular process, system, product or small group of products. On-site, first order and some second-order impacts are considered. Need to define appropriate system boundaries to minimise the truncation error. Difficult for meso or macro scales such as government or industrial sectors because of the complexity, although estimates can be derived they usually require assumptions that a subset is representative for a larger grouping.

Source: Author, developed from Wiedmann and Minx (2008)

[19] An independent charity that works with tourism decision makers, to help ensure tourism benefits the destination community and the environment.

The second most popular methodology is the top-down Input-Output approach, which uses detailed economic Input-Output tables[20] (for example Tourism Satellite Accounts)[21] and extends the analysis for environmental accounting to include natural and environmental resources. This is a macro-economic modelling technique combining an economic modelling framework with data from environmental accounts. This form of integrated economic-environmental accounting illustrates the interactions between the economy and the environment. The technique provides consistent and comparable data and can be used to establish direct and indirect estimates of emissions from production and consumption. This approach is particularly useful because it enables comparisons with other sectors and provides the ability to assess the potential impact of macro-economic instruments. It is often applied at meso and macro scales, for example, calculating impacts embedded in the consumption of goods and services of a whole country or region which is better suited to the 'top down' approach provided by Environmentally Extended Input-Output (EEIO) methods (Miller and Blair, 2009).

Becken and Patterson (2006) applied and compared the bottom-up data analysis with the top-down input-output approach when they calculated national carbon dioxide emissions from tourism in New Zealand. They found that despite different data, starting points, assumptions and methods, they produced similar results. A combination of the two methodologies would be ideal: to preserve the detail and accuracy associated with the bottom-up approach, such as information on the tourism drivers of emissions; while maintaining the coverage and robustness of the top-down approach which allows assessment of the sector as a whole. Becken and Patterson (2006) found this was important to enable identification of the main

[20] A quantitative economic matrix that represents the variable interdependencies (monetary inputs and outputs), within and between economic systems e.g. the tourism sector.
[21] A standard statistical framework and the main tool for the economic measurement of tourism – a satellite account supplements, rather than replaces existing accounts (United Nations, 2010).

causes of emissions alongside the magnitude of emissions to inform strategies to reduce impact. This combined approach was also used by Perch-Nielsen et al. (2010) when they reviewed the greenhouse gas intensity of the tourism sector in Switzerland.

Life Cycle Analysis (LCA) has also been used by a few researchers, either in isolation or combined with another methodology. It is described as a bottom-up method which considers the impacts of individual products from cradle to grave, through an inventory of energy and material inputs and releases. It is most suited to the micro levels because it starts from a single product and attempts to measure the impacts generated at each stage of the product's supply chain. To measure the impacts associated with a visitor's total consumption of goods and services using the LCA method would be extremely time-consuming and data intensive. There are many different products, services and processes to examine, and maintaining a consistent approach would be challenging. However, a selected sample could be made. Kuo and Chen (2009) used the LCA approach to assess the environmental loads from tourists, to quantify carbon dioxide emissions for tourism on Penghu Island, Taiwan.

A combination of life-cycle analysis and Input-Output analysis could be a robust ecological-economic modelling approach, as this provides the opportunity for mutual verification and to overcome the shortfalls of each technique, and also helps identify issues and data gaps (Wiedmann and Minx, 2008; Peters and Solli, 2010). Additional methodological approaches that have been applied to estimate carbon footprints in tourism include: the use of a Computable General Equilibrium model by Olsthoorn (2001) to look at the direct CO_2 footprint of international air travel between 1950 and 2050; a literature review of studies to gather data on the food footprint of tourism (Gössling, Garrod, Aall, Hille, and Peeters, 2011); and the use of a Global Tourism and Transport Model by Peeters and Dubois (2010) to examine global tourism travel scenarios to calculate likely changes to emissions.

Two studies considered direct and indirect emissions for smaller ‘destination’ geographies below a regional level (Konan and Chan, 2010; Liu, Feng and Yang, 2011), and only one of these covered more greenhouse gases than just CO_2 (Konan and Chan, 2010). Reasons for this could include the source of funding and the purpose of the research. In addition, the availability of detailed data at smaller geographies is limited. The most frequently researched scale is national, with New Zealand having the most studies in this area. At the commencement of this thesis, only one peer-reviewed study was found on tourism carbon footprinting in the UK, for Wales (Jones and Munday, 2007). Since then, two further studies have been published for Wales (Jones, 2013; Munday, Turner, and Jones, 2013), and one for the South West of England (Whittlesea and Owen, 2012).

Table 2.4: Studies that investigate the emissions associated with tourism

Scale	Geography and Research Focus	Footprint	Method	Source
Global / International	Worldwide – Leisure Tourists	Direct energy and CO_2-e	BUD	Gössling, 2002
	Food production and consumption	Direct and Indirect CO_2-e	LR	Gössling et al (2011)
	International Air Travel 1950 – 2050	Direct CO_2	CGE	Olsthoorn, 2001
	Global Tourism Travel Scenarios to 2035	Direct CO_2	GTTM	Peeters and Dubois, 2010
	Global Tourism and emission reduction targets	Direct CO_2e	-	Scott, Peeters and Gössling, 2010
	Global Tourism – Five Sectors	Direct CO_2	-	UNWTO, UNEP and WMO, 2008
National	New Zealand – International Passenger Air Travel	Direct energy and CO_2	BUD	Becken, 2002;
	New Zealand – National Tourism Emissions	Direct energy and CO_2	BUD / TIO	Becken and Patterson, 2006
	New Zealand – Travel emissions by tourist type	Direct CO_2 and yield	BUD	Becken and Simmons, 2008
	Germany – Resident holiday travel behaviour	Direct CO_2-e	BUD	Böhler et al (2006)
	Australia – Marine Tour Boat Industry	Direct CO_2-e	BUD	Byrnes and Warnken, 2006
	France – Tourism mobility in 2050	Direct CO_2-e	BUD	Ceron and Dubois, 2007
	Australia –National tourism industry	Direct and Indirect CO2-e	TIO	Dwyer, Forsyth, Spurr and Hoque, 2010
	France – Tourism case study	Direct CO_2-e	BUD	Gössling et al, 2005
	Sweden – Accommodation, transport and activities	Direct CO_2	BUD	Gössling and Hall, 2008
	New Zealand – International Cruise Ship Travel	Direct energy and CO_2	BUD	Howitt, Revol, Smith and Rodger, 2010
	Canada – Air Transport and Food / Beverage services	Direct energy and CO_2-e	TIO	Jackson, Kotsovos and Morissette, 2008
	Wales – Tourism Consumption	Direct and indirect CO_2e	TIO	Jones and Munday, 2007
	New Zealand – Tourism Sector	Direct energy and CO_2	TIO	Patterson and McDonald, 2004
	Switzerland – Tourism and six sub-sectors	Direct CO_2-e	BUD / TIO	Perch-Nielsen, Sesartic and Stucki, 2010
Region / State	Antarctic – Cruise Tourism	Direct CO_2	BUD	Eijgelaar et al, 2010
	Queensland, Australia – Tourism industry	Direct and Indirect CO_2-e	BUD	Forsyth et al, 2010
	Val di Merse, Italy – Tourism case study	Direct CO_2-e	BUD	Gössling et al, 2005
	Whistler, British Columbia – Tourism Sector	Direct and Indirect CO_2-e	BUD	Kelly and Williams, 2007
	Davos Tourist Region, Switzerland – Community Impact	Direct CO_2	BUD	Walz, Calonder, Hagedorn, Lardelli, Lundstrom and Stockli, 2008
Island	Fiji – Accommodation Businesses	Direct energy and CO_2	BUD	Becken, 2005
	Seychelles – Tourism case study	Direct CO_2-e	BUD	Gössling et al, 2005
	Hawai'i- Visitor Emissions	Direct and Indirect CO_2-e	TIO	Konan and Chan, 2010
	Penghu Island, Taiwan – Tourism	Direct energy and CO_2	LCA	Kuo and Chen, 2009
Parks / Forests	Sekayu Forest in Malaysia – Travel modes	Direct CO_2	BUD	Bhuiyan et al, 2012
	Rocky Mountain National Park – Tourism case study	Direct CO_2-e	BUD	Gössling et al, 2005
City, District and County	Bournemouth, UK – Holiday travel to Europe	Direct CO_2	BUD	Dickinson et al, 2010
	Amsterdam – Inbound Tourism case study	Direct CO_2-e	BUD	Gössling et al, 2005
	Chengdu City, China – Domestic Tourism	Direct and Indirect CO_2	BUD	Liu, Feng and Yang, 2011
Product / Event	Holiday trip from London to Poole (England)	Direct and Indirect CO_2-e	BUD / LCA	Filimonau et al., 2011
	Brecon Jazz Festival (Wales)	Direct and Indirect CO_2-e	TIO	Jones and Munday, 2007

BUD *= Bottom-up Data Modelling* ***TIO*** *= Top-down Input-Output Analysis* ***LCA*** *= Life cycle Analysis*
CGE *= Computable General Equilibrium Model* ***LR*** *= Literature Review* ***GTTM*** *= Global Tourism Transport Model*

The review of tourism footprint studies highlighted some boundary considerations that are important to clarify. Table 2.5 summarises the findings and key areas for further investigation to inform the methodology section of the thesis.

Table 2.5: Carbon footprint boundary considerations

Boundary Considerations	Summary of Findings
Is the footprint accounting for the tourism industry (production) or visitor (consumption) perspective?	There is a distinction between measuring the impact of the tourism sector and measuring the impact of tourists themselves. Measuring only the tourism sector's impact, a production perspective means that services used by tourists and residents alike (transport, catering etc.) are not accounted for. Measuring the impact of tourists themselves from a 'consumption' perspective allows a more complete impact to be investigated and can include all the services, activities and products consumed. This can cover the parameters of the whole trip and should include food and consumer items, travel within destination and impact on other public services which are often not accounted for. The research focus and definition for tourism and tourist, alongside the boundaries for impact are important to identify and justify, as boundary choices can significantly affect the size of the footprint.
What metrics are used to interpret the results?	It is important to explore the total impact and relative measure of impact intensity per visitor night. It would also be useful to consider and compare overseas, domestic and day visitor footprints. This would enable investigations into different visitor profiles, holidays and choices.
What methodology is applied?	Different methodologies are employed: simple multiplication to complex matrix systems: 'bottom up' and 'top down'; use of integrated economic-environmental accounting; step-wise methodology; use of Tourism Satellite Accounts; use of production and consumption approaches; use of input-output frameworks; and use of Life Cycle Analysis.
What greenhouse gases are included?	The full set of greenhouse gases (CO_2e) should be accounted for as these are covered by the Kyoto Protocol and the UK Climate Change Act. Basing studies only on CO_2 can significantly underestimate tourism's contribution and does not consider the impact of non-carbon emissions from food production and aviation.
Does the research include direct and indirect emissions?	Most tourism studies only investigate direct emissions from energy use, and exclude indirect emissions from energy use embedded in construction and product development (lifecycle perspective). Consequently the full impact will not be accounted for and the result will be an underestimation. Studies measuring emissions from energy use only allow comparison of activities which require energy.
What timeframe and geographic boundary is considered?	There are few studies that examine smaller geographies below a regional level, for example sub-regions and districts as the 'destination' often comprises a country or island. There do not appear to be many tourism carbon footprint studies undertaken in the UK, particularly in England.

Source: Author

These methodological approaches provide a mechanism to estimate emissions from tourism, but this does not necessarily mean they help to facilitate or demonstrate a reduction. Reliability is also an important consideration which relates to reproducibility or how likely the result will be the same, but a method can be highly reliable without being valid (Jorgenson, 2009). There also appears to be limited alignment with standards such as the Greenhouse Gas Protocol or ISO 14064. This raises concerns with regards to transparency, comparability and accountability.

Uncertainty will not disappear; there will be complexities and uncertainties in estimates and issues of accuracy and consistency of measurement over time. There are also challenges with going beyond carbon to include gases such as methane and nitrous oxide. “Greenhouse gas emission accounting, like much other accounting, is set to remain part science, part modelling, part guess work and part negotiation” (Milne and Grubnic, 2011, p962). Estimating the footprint in itself is a major task with inherent ambiguities, assumptions and issues of accuracy. It is important, therefore, to be transparent about the limitations, data robustness and assumptions made. It is about developing ‘acceptable’ estimates through methods that have been agreed, tested, reviewed or audited. Forecasting is also problematic and the further into the future studies go, the less accurate they can be (Milne and Grubnic, 2011).

Findings from existing studies do not appear to be directly applicable for the South West of England, as they are from different countries with different tourism products and tourists. Although there are some generic consistencies with existing research, such as the disproportionate impact of overseas visitors, an enhanced level of detail is needed. It would be useful to explore a more complete footprint from the visitor impact perspective rather than the industry, and to explore areas that have had limited investigations on sub-sectors such as food and shopping.

Another key challenge with different studies is the inability to compare and benchmark between them, yet an important component for performance improvement would be to investigate and compare areas – for example, local destinations within a region. The metrics used to interpret the results are also important. An exploration of both the total and absolute impact as well as a relative measure of impact intensity per visitor night, would enable an improved understanding of the outputs - for example, to understand what drives high impact, and what can be done to reduce it for different visitors and/or tourism products.

Every indicator and measure has strengths and weaknesses and these are considered for the carbon footprint in Table 2.6.

2.4.5 Scenario Modelling and Stakeholder Engagement

The use of scenario modelling in destination planning dates back to the 1970s and methodologies have become increasingly complex and dynamic (Gössling and Scott, 2012). Tourism researchers have used modelling to back-cast and forecast alternative scenarios to reflect changing factors such as mobility, demographics, terrorism and social change (Gössling and Scott, 2012). The outcomes can be used to investigate the implications of change for tourism management, planning, promotion and investment.

Scenario modelling is essentially a strategic planning method which can facilitate a 'continuous process of learning, adapting and adjusting' to help organisations prepare and respond to possible futures (UNWTO and ETC, 2008). For example, it can be suitable for exploring low-carbon tourism futures and examining the benefits and impacts of different mitigation strategies. Several authors have gone beyond a carbon baseline and have quantitatively modelled future low-carbon tourism scenarios (UNWTO, UNEP and WMO, 2008; Dickinson et al, 2010; Gössling et al., 2005; Gössling and Hall, 2008; Peeters and Dubois, 2010), utilising forecasting and back-casting techniques. However, few investigate emissions at the sub-regional or local destination level (Whittlesea and Owen, 2012), which may be useful to demonstrate relevance and promote accountability with tourism stakeholders.

Table 2.6: Strengths and weaknesses of estimating the tourism carbon footprint

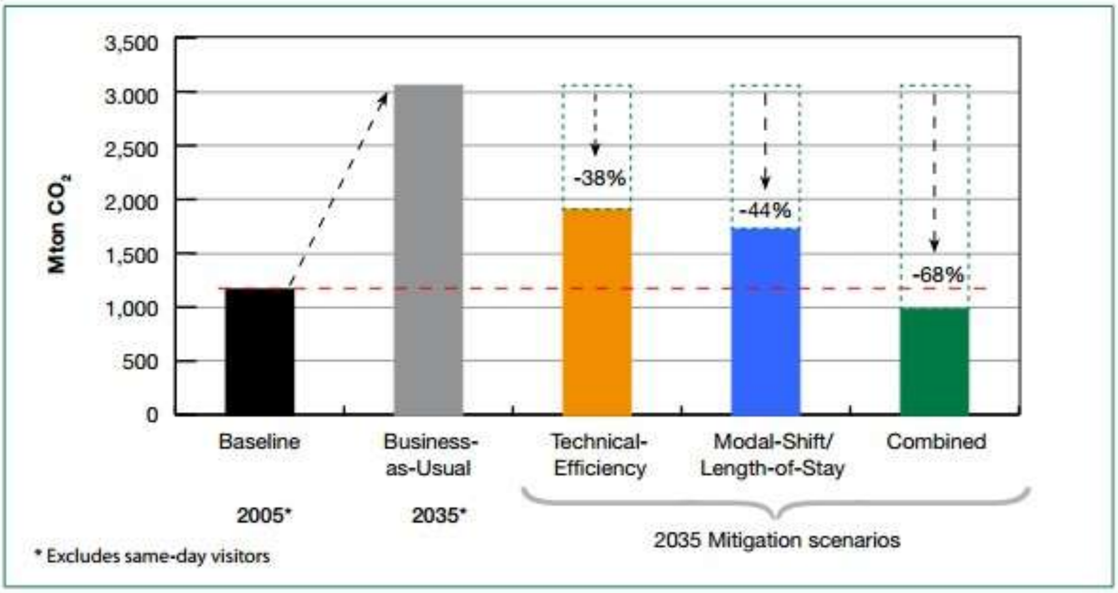
Strengths	Weaknesses
1. Allows for an assessment of tourism's contribution to greenhouse gas emissions (can include direct and indirect) 2. Consistent economic accounting and emissions data is available for the majority of countries 3. Can be compatible and comparable with existing global economic, trade and environmental accounting models 4. Can help identify unsustainable consumption patterns and provide a process for identifying cost and carbon improvements 5. Can increase producer and consumer awareness regarding consumption choices provided a consistent methodology is used 6. Ability to allocate responsibility for greenhouse gas emissions to consuming entities or activities 7. Area, sector, business, individual, product and service based application and opportunity to benchmark if the same methodology is used 8. Can be used to benchmark against targets which can implicitly bear a message of responsibility if linked to modelled thresholds for total emissions to keep under the 2 degree target 9. Ability to track the impacts of operations and international supply chains, spanning multiple sectors in multiple countries 10. Allows the adoption of different accounting perspectives according to the producer, consumer, or shared responsibility principle 11. Enables scenario simulations of the combined effects of implementing economic, social and environmental policies or change 12. Can consider the complete Life Cycle Assessment (LCA) 13. One indicator makes it easier to communicate to stakeholders and communities than sets or indices	1. Calculating the carbon footprint does not answer the question whether there is a carbon concentration or climate change problem 2. Deriving a maximum 'allowable' amount of emissions (a "carbon footprint threshold") is needed for the sector 3. Only looking at greenhouse gases and is not able to track the full palette of human demands on the environment (e.g., resource depletion) 4. Additional impact assessment models are needed to analyse the impact of climate change (at both national and sub national levels) 5. Efforts are needed to set up and update a system of multi-regional IO tables and related environmental extensions 6. A lot of the data required to produce multi-regional IO tables is not yet available, particularly accurate data on emissions from production sectors in transition and developing countries 7. Currently, no uncertainty studies are available for quantifying emissions 8. It is a weakness to only study one environmental impact especially in the wider context of sustainability 9. Estimating a full footprint is a complex task and tools that are available are either too simplistic or too complex 10. Current lack of consistency in calculation and reporting methods which means it is difficult to compare published footprints 11. Research and tools / calculators can lack information about their methods and estimates, which impedes validation 12. Importing countries could be hesitant about the consumption approach as the emissions responsibility is shifted to consumers 13. Need a consistent approach and more links to existing standards

Source: Author, developed from Galli et al., (2012); and Schepelmann, Ritthoff, Santman, Jeswani, and Azapagic, (2008)

Figure 2.5 illustrates the results of three scenarios to explore the potential to reduce global tourism emissions by 2035 through: (i) technical efficiency; (ii) alterations to travel mode and length of stay; and (iii) a combined scenario (UNWTO, UNEP and WMO, 2008). The combined scenario achieved the greatest reduction in emissions (-68%) and was the only scenario that achieved a reduction (of 16%) below the 2005 baseline when sector growth was taken into account. This represents the potential to reduce tourism's emissions (UNWTO, UNEP and WMO, 2008), but 16% is considerably less than the 34% 2020 UK emission reduction target.

With the exception of Gössling and Hall's (2008) study for Sweden 2020 (direct CO_2 only), carbon scenario modelling for tourism tends to be global in nature, and involve long timeframes of 20-30 years (Scott et al., 2010; Peeters and Dubois, 2010) which are beyond strategic planning timeframes for tourism. Tools for gathering, processing and modelling data on emissions have evolved considerably over recent years, alongside improved approaches to interpreting, visualising and disseminating the data, although the gap between the 'scientific modelling' and the 'informational tools for decision-making' appears to be widening (Morency, Trépanier, Piché, and Chapleau, 2010). In addition, the tourism research literature on carbon footprinting, future scenarios and climate change mitigation seems to have failed to influence the actions of the tourism industry (Buckley, 2008; Lane, 2009), described as a "deeper longstanding dysfunctional relationship between academics and practitioners in tourism" (Weaver, 2007, p68). This could be a critical barrier to action and would appear to be an area that needs further investigation. Scenario modelling is discussed further in section 3.4.2.

Figure 2.5: Future global tourism CO_2 emissions including mitigation scenarios



Source: UNWTO, UNEP and WMO, 2008, Figure 6.5, p.37
Permission to reproduce this figure has been granted by the UNWTO.

Few studies appear to have investigated tourism emission scenarios at a regional destination level. Peeters (2013) developed a Global Tourism and Transport Model (GTTM) to explore tourism solutions to reducing emissions on a global scale. The original version was used to generate the UNWTO forecast and mitigation scenarios for 2035 (UNWTO, UNEP and WMO, 2008). The model had improvements to allow for back-casting and model optimisation to help identify solutions to reach emissions reduction goals, and should enable the impact of emissions reduction policies to be explored (Peeters, 2013). The tool was not designed to be widely available and at the time of writing had not been applied to smaller geographies. Carbon calculators, tools and models exist for national inventories, communities, local authorities, businesses, products, events, projects and even for visitor trips, but little exists for the ‘destination’ (Whittlesea and Owen, 2012).

An effective development process for tourism policy and strategy, requires collaboration with key stakeholders and needs the process to be dynamic and interactive, to ensure it can adapt to changes in the destination (Hanlan, Fuller and Wilde, 2006). Pforr (2006) identified that political administrative actors and tourism associations have a dominant and central position in the tourism network and therefore considerably more influence on the formulation of tourism policy and development plans. This challenge needs to be overcome to ensure that decision-making is representative of the broader community and destination interests and not dominated by particular commercial or political interests (Hanlan, Fuller and Wilde, 2006). Tourism decision-making should also represent community interests and 'local' ideas for development, collaboration and delivery (Blunt, 1995). If the main destination agency is not committed to this approach, the efforts to encourage participation, dialogue, interactions and shared learning among tourism actors may be ineffective (Wray, 2011). It would seem that embedding carbon accounting and management into the mainstream tourism policy and planning process could encourage and help facilitate a low-carbon shift.

2.5 Chapter Summary

Tourism has a relatively high carbon footprint that is set to continue to rise unless there are significant shifts in the tourism system. Existing research suggests carbon mitigation can achieve reductions in emissions, yet it appears that little action is being taken at a strategic level in the UK to examine or address the issue. Measuring and understanding the carbon impact of tourism and its component parts would appear to be an important foundation.

The review of tourism carbon footprint studies demonstrates a variety of different definitional, conceptual and methodological interpretations, and these issues of comparability and consistency can inhibit efforts to drive low-carbon tourism management decisions. There are also limited studies and evidence available for destinations in England. This presents an opportunity for research to investigate similarities and differences in the carbon footprint of visitors across a series of sub-regional destinations. This can incorporate scenario modelling in line with tourism plans and aligned to national emission reduction targets and timeframes.

Few studies appear to have engaged tourism stakeholders with the footprint results in order to explore the implications of the data and examine how emissions reductions can be achieved. This is an important part of the research, as the literature suggests that even where carbon footprinting studies have demonstrated a need for decarbonisation of the sector, and some instances identified potential pathways, the research outputs failed to inform policy and practice which remains focused on ‘business as usual’ growth. The literature suggests that tourism governance can preclude opportunities, so this thesis will investigate these challenges further with tourism stakeholders at destination level, and identify how these could be addressed through the related opportunities. It also attempts to narrow the gap between the researcher undertaking emissions modelling and subsequent interpretation and application by tourism practitioners in destination management.

Carbon mitigation would seem to be an imperative and an opportunity for tourism planning and destination resilience in a carbon constrained society. This would support the tourism industry to remain innovative, competitive and profitable but the ambiguous role of destinations and tourism stakeholders remains an issue (Gössling, 2011). This thesis also sets out to examine and clarify this ambiguity and to identify opportunities that could help inform a framework for a low-carbon transition.

The next chapter details the methods that will be employed to address the research problem, providing an explanation and justification for the research approach and case study area.

3 Methodology

3.1 Introduction

This chapter introduces and discusses the methodology employed to address the research problem and the three research questions (section 1.3). The philosophical and epistemological approach of the study is explored, and the methodological considerations and choices made to generate the knowledge discussed. The chapter is structured into three main sections. The first provides an introduction and methodological overview describing the research context, structure and setting in which the research took place. The second section describes the scope of the carbon footprinting and details the formation and structure of the REAP Tourism tool. The third section describes and reviews the qualitative methodologies employed to engage tourism stakeholders. These include semi-structured workshops, a semi-structured evaluation questionnaire, and semi-structured interviews. The final section summarises this chapter.

3.1.1 The Research Context

Tribe (2004) identifies a direct link between studies that suit business needs and the positivistic approach[22] to knowledge creation in tourism. He suggests “that there is no such thing as interest free knowledge” (p59) and encourages a broader range of perspectives and alternative approaches to avoid gaps and limitations in knowledge. This is supported by Jamal and Everett (2007, p58), who argue that the “economics-externalities camp” (industry-oriented aspect) has overshadowed the “impacts-internalities camp” (social and cultural aspect) of tourism research, with the business approach dominating tourism studies.

Evidence seems to show that tourism researchers are adopting a ‘mix and match’ approach of different research perspectives and paradigmatic principles to advance

[22] Rooted in physical science and concerned with gaining empirical scientific evidence and knowledge to reveal how society operates - seen to be objective and characterised by quantitative methods and statistics

the boundaries of tourism research beyond the traditional 'positivist' approach (Phillimore and Goodson, 2004). For example, more discursive and reflexive approaches can provide new dimensions of knowledge, especially around abstract matters such as the social and environmental impacts of tourism and the role of tourism in societies (Riley and Love, 2000).

To help clarify the research paradigm applied, it is important to unpick the elements that determine how the research will be undertaken and interpreted and how these influence the choices made throughout the research process. Jennings (2010) and Phillimore and Goodson (2004) encourage consideration of these ontological, epistemological and methodological 'elements' and foundations in all research projects, and Table 3.1 presents the paradigm applied in this thesis described under these three elements.

Table 3.1: Describing the different elements of the research paradigm

Research Elements	**Description of the inquiry, in relation to this research**
Ontological	Multiple realities, view-points, power relations, politics, processes, interactions and interrelations exist for many different stakeholders and destinations in respect of tourism and climate change mitigation, making the research area complex, emotive and multi-disciplinary. Questions of seeing, experiencing, meaning, being and identity require a critical line of inquiry and reflective assessment.
Epistemological	The relationship between the researcher and the researched was interactive and collaborative. An action-oriented approach was taken that considers tourism stakeholder's subjective perceptions, relations, actions and pre-conditions that impact on emissions reduction. The knowledge sought was an understanding of how tourisms contribution to carbon emissions could be reduced. To consider causal mechanisms, variation in different tourism destinations, the perspectives of stakeholders and the variable function and form of Destination Management Organisations.
Methodological	Importance of multiple measures and observations, and data triangulation. The knowledge was generated through a multi-method approach that engages tourism stakeholders and practitioners. The method estimated quantitative tourism carbon data to explore baseline and future emissions for tourism. The next stage used a qualitative approach through participatory workshops, evaluative feedback, and interviews with stakeholders - to examine the usefulness of carbon data, and capture explanatory and causal data on the challenges, opportunities and enablers for a low-carbon tourism economy.

Source: Author

This research aligns to two major research paradigms, critical and interpretive. This shapes the structure of inquiry which is described in Table 3.2. Consideration of different research paradigms helps to identify the philosophical framework for research, to guide the process of inquiry and inform the choice of research methods. Determining the research paradigm is a key consideration. However, researchers should be mindful that it can suppress new lines of inquiry and creativity (Clarke and Dawson, 1999).

Table 3.2: Description of two major research paradigms aligned to this thesis

Research Paradigm	Description
Critical theory	• Critical realist. • Interactive and subjectivist: values immediate inquiry which is participative and/or reflects the values of human players. • Participative and transformative methodology, seeking the elimination of false consciousness and can facilitate a transformed world.
Constructivism /Interpretive theory	• Relativist. • Realities exist in the form of multiple mental constructions, socially and experientially based. • The complex social world can be understood from the point of view of those who operate within it, requiring collaborative research. • The researcher and researched are viewed as partners in the production of knowledge and the interaction between the two are key for research and understanding. • Interactive and subjectivist: argument and discussion are central to this approach to knowledge production. • Hermeneutic and dialectic methodology, individual constructions are compared and contrasted with the aim of generating one or a few constructions on which there is consensus.

Source: Author, developed from Hollinshead (2004) & Phillimore and Goodson (2004)

The approach taken in this study is grounded in both the critical and interpretive paradigms and uses a mix of quantitative and qualitative methods to ensure the outcomes generated can be applied and used by tourism practitioners in the field. The research examines the interface between the social world of tourism and destination management, with the physical impact on greenhouse gas emissions in the natural world. Pernecky (2010, p11) suggests that "tourism can be conceived as the result of our *being-in-the-world*: it is how we make sense of our lives (and the lives of others as well as the world) meaningfully" and suggests that research should explore more "what tourism can *be* and can *do*" (p11).

Quantitative research methods alone can limit the researcher's understanding and insight into the 'real' world of tourism and qualitative approaches can help to explore the complexities and unpick subtle issues (Hollinshead, 2004). A combination of both methods was employed but the research was fundamentally interpretive, emergent and evolving in nature. Through the use of quantitative scenario modelling the carbon impact was estimated and alternative low-carbon pathways explored. This was followed by an interpretive and collaborative approach, sharing the data outcomes with stakeholders and utilising an interactive process through qualitative methods, to observe, gather data and develop theory (Creswell and Clark, 2007).

Phillimore and Goodson (2004) suggest that tourism researchers engaging with interpretive paradigms and qualitative methodologies should ensure the transparency of their research approach, data collection and analysis.

3.1.2 Researcher Reflexivity and Positionality

Reflexivity is a valuable tool for reflection on the impact of the researcher and their values and subjectivities, which can help in evaluating interpersonal relationships and the integrity of the research process (Finlay, 2002). It is considered essential to the research process (Corbin and Strauss, 2014), although there is still debate about the feasibility of accounting completely for the influence of the researcher (Cutcliffe, 2003). The process of reflection, to give serious thought or consideration in the learning context, is described by Boud, Keogh and Walker (1985, p19) as "intellectual and affective activities in which individuals engage to explore their experiences in order to lead to new understandings and appreciation".

This reflective process was important in this study because of the positionality of the researcher, who has a background in low-carbon tourism development and worked for the regional Tourist Board in the South West of England for five years (before and during the early parts of the research). Whilst this provided insider understandings and perspectives on the research, it also had the potential to affect neutrality and how participants might view the researcher and the research. To help manage this, the design, delivery and analysis abided by the hall-marks of qualitative researchers proposed by Marshall and Rossman (2011, p2):

- to view social phenomena as holistic and complex;
- engage in systematic reflection on the conduct of the study;
- consider multifaceted and iterative reasoning (deduce and induce information);
- to be sensitive to and consider how personal biography and social identity could shape the study.

The primary focus was to acknowledge subjectivity and the researcher's perspective, knowledge, biases and experience and to use these to increase sensitivity and awareness. The aim was to understand and interpret the data and outcomes from the perspectives of the participants, whilst at the same time being mindful of the researcher's position, recognising that the research findings will be a product of both (Corbin and Strauss, 2014). Self-reflection throughout the methodological and analytical processes (recorded in the researcher's log book) helped to maintain a collaborative and open approach that increased researcher sensitivity and awareness of outcomes and consequences (Hennink, Hutter and Bailey, 2011). Corbin and Strauss (2008, p33) propose three considerations:

- to not lose sight of the data and compare knowledge and experience against the data;
- keep focussed on similarities and differences by working with concepts in terms of their properties and dimensions;
- it is what participants are saying or doing that is important and not the researcher's perception.

After each workshop and interview, and throughout the analysis, the researcher reflected on whether questions were probed and presented sufficiently and appropriately, whether leading questions cropped up, and the interpretations made using the three considerations outlined by Corbin and Strauss (2008). In addition, positionality affects the power relations between the researcher and those involved in the research (Hopkins, 2007). For example, how the researcher presents and introduces themselves and how they establish rapport can influence what is shared, so reflection on this was also important (Hennink et al, 2011).

Participants may say what they think the researcher wants to hear rather than voicing their own opinion, the so-called deference effect (Bernard, 2012). This was important to avoid for two reasons. Firstly, the sensitivity of the carbon impact of tourism may have meant that participants, especially in the interviews, may have wanted to be seen to be doing the right thing. Secondly, because the researcher had worked in this field as an advisor; some of those interviewed who were aware of this or who had experienced support, might feel the need to demonstrate activity and knowledge even though this might not have been operationalised.

A way of identifying if deference is influencing the results is if there is a lack of diversity of opinions and participants are tending to agree rather than express positive and negative views. To minimise the likelihood of this occurring, the researcher and facilitators refrained from expressing a point of view and stressed the value of individual and honest opinions, positive and negative (Hennink et al, 2011). In addition, both individual and group perspectives were sought.

Hall (2004) highlights the importance of reflexivity in qualitative tourism research and the need to be clear about the researcher's personal position, biography and ideological stance, to ensure this does not impact on the research approach and outcomes. Conditions embodied in the gender, class, ethnicity, age, experience, education and beliefs of the researcher will also influence what is understood and how information is interpreted. This is recognised alongside the potential influence of cultures, institutions and structures on the research. It is important, therefore, to undertake self-reflection throughout the research. On a practical level, a research diary was used to record notes on self-reflection, thought processes, issues that arose and learning from the process. These were used to inform the research and the conclusions.

Research colleagues and a sample of stakeholders were also engaged in testing and providing feedback on various stages, which included:

- drafted outputs from the model and scenarios;
- materials for presentation at the participatory workshops;
- the structure and content for the participatory workshops;
- draft evaluation and semi-structured questionnaire;
- presentation of the preliminary findings.

In addition, peer review and external verification was sought by presenting the findings and conclusions at national and international tourism and academic events, including:

- UNWTO/UNEP Climate Change and Tourism Capacity Building Seminar at the University of Oxford 2008;
- Euromeeting 2008 on European sustainable and competitive tourism;
- Best of Britain and Ireland Event (BOBI) 2009;
- SW Branch of the Regional Studies Association 1st Annual Conference UWE 2009; International Forum on Sustainability, Climate Change and Tourism held at Bournemouth University in November 2009;
- Balestrand Summit in Norway 2010; World Travel Market 2010;
- Victoria Tourism Industry Council's (VTIC Australia) Carbon Tax Forum, May 2012.

3.1.3 Methodological Overview

Initially, the approach and methodologies for this study were primarily 'action research' orientated, and were developed from work-based research and questioning from within South West Tourism. However, South West Tourism closed in 2011 and, subsequently, the methodology became more reflexive and participatory in nature. The research has nevertheless retained an explicit commitment to action and to continue collaboration with tourism stakeholders in the region, in both posing the questions and gathering data. The three research questions examined were:

1. How effective is the carbon footprint to inform and engage tourism stakeholders in the transition to a low-carbon tourism economy?
2. What are the strategic opportunities and challenges for a low-carbon transition in tourism destinations?
3. How can the opportunities be enabled?

The research utilised a multi-method multiple destination approach to respond to the research questions. There were four distinct but linked stages to this research, each utilising a different method. A description of each stage, the method and purpose, and how these respond to the research questions is given in Table 3.3.

Stage 1 undertook the baseline carbon modelling using REAP Tourism (Resource Energy Analysis Programme for Tourism), a footprinting tool which is described further in the next section. *Stage 2* applied REAP Tourism to examine alternative scenarios through the modelling of different growth and mitigation strategies. *Stage 3* delivered semi-structured participatory planning workshops to engage strategic tourism practitioners in reviewing and reflecting on the outcomes of *stages 1 and 2*. The purpose was also to evaluate the effectiveness of carbon footprinting as an informative tool for tourism stakeholders and strategy development at destination level. The workshops were also used to identify the opportunities and challenges perceived by tourism stakeholders to reduce tourism's carbon footprint. *Stage 4,* the final stage used a structured workshop evaluation form and semi-structured interviews to gauge individuals' views and experiences. The objective was to further investigate the low-carbon opportunities and challenges for tourism destinations and to consider how tourism destinations could respond.

Table 3.3: Research methodology and purpose

Research Question	Research Stage	Methodology	Purpose
RQ. 1 RQ. 2 RQ. 3	1. Develop and examine a baseline carbon Footprint	Utilise REAP Tourism to undertake carbon modelling and analysis	Identify and use available data to calculate and examine the CO_2e footprint composition of different visitor types and profiles, different destinations and events. Analyse, compare and classify the results.
RQ. 1 RQ. 2 RQ. 3	2. Develop and examine carbon footprint scenarios for 2020	Scenario modelling using the scenario function in REAP Tourism to explore different growth and mitigation strategies	To examine the impact of different growth and mitigation strategies, to investigate whether a low-carbon pathway could be achievable in line with the UK 2020 target.
RQ. 1 RQ. 2 RQ. 3	3. Participatory Planning Workshops	Semi-structured participatory workshops to engage tourism stakeholders in group discussion and debate	Investigate the usefulness of the carbon footprint results with tourism decision makers. Review the findings and practical relevance. Engage practitioners in the identification of opportunities and challenges.
RQ. 1 RQ. 2 RQ. 3	4. Evaluation questionnaire and semi-structured interviews	Individual structured feedback and evaluation with tourism stakeholders	Deeper examination of the challenges and opportunities of moving toward a low-carbon tourism system in destinations. To enhance understanding.

Source: Author

The four-stage multi-method (quantitative and qualitative) and multiple destination approach to apply, analyse and review the carbon footprint data thus served to legitimatise the findings. The use of multiple and converging sources of evidence also enabled comparative investigation and a degree of data and methodological triangulation (i.e. using multiple methods to address the same question). The combined findings from the research are likely to be more accurate and convincing, and objective and accountable, as they are based on multiple sources, types and convergence of the evidence. Each of the stages will be considered in more detail in the subsequent sections with a justification and description of the specific methods used. The methodological approach is intended to interpret the outcomes in a way that is useful and practicable for practitioners, and this perspective is an important foundation for this research.

3.2 South West of England – Study Area

The study area for the research was the South West of England. The rationale for this was based on a number of factors including: representativeness, distinctiveness, and its variety of destination types (e.g. urban, seaside and rural). It is also a mature tourism destination, and has been the most sought after holiday region in England for 150 years (About-Britain, 2014). UK residents alone made 20.22 million trips to the South West in 2011 (VisitEngland, 2011), surpassing all other English regions as well as Scotland (13.4m) and Wales (9.7m) (TNS, 2011). The 2008 'Value of Tourism' (South West Tourism, 2010) report showed that tourism contributes around £9.4 billion to the SW economy annually and supports approximately 198,000 full time equivalent jobs. However, the annual 23 million staying and 97 million day visitors contribute an estimated annual carbon impact of 12.3 million tonnes per year (Whittlesea and Owen, 2012).

The South West region of England was also distinctive for this research in its achievements in low-carbon development and sustainable tourism. For example, under the UK Low Carbon Industrial Strategy (Crown, 2009b), the South West was identified as the UK's first low-carbon economic area**.** The region recognised the importance of sustainable tourism in the regional tourism strategy 'Towards 2015' (South West Tourism, 2005) by embedding the concept as part of its vision and setting out a commitment to deliver 'truly sustainable tourism'.

There has also been a reasonable level of activity on the topic of tourism and climate change. This includes, from an adaptation perspective, the production of a

UK Climate Impacts Programme (UKCIP) national case study (Whittlesea and Amelung, 2013), which explored the implications of future climate projections on tourism and led to the development of bespoke business support and advice[23]. On mitigation, the South West Tourism Alliance (SWTA) published '*Principles of Success: Guidance for tourism in South West England'* (2011), which promoted an overarching commitment to sustainable low-carbon growth and identified the carbon footprint as a core indicator alongside visitor expenditure. This suggests that sub-regional destinations had developed an awareness of the low-carbon agenda, although it should be recognised that formal regional tourism support ended shortly after the document was published.

The South West also provided a plethora of different tourism geographies and destinations which can be explored, ranging from cities to rural moorlands and coastline. South West Tourism recognised and worked with nine sub-regional Destination Management Organisations alongside numerous local Area Tourism Partnerships (ATPs) at district level.

Figure 3.1 depicts the study area and the nine destination areas reviewed for this thesis. This provided an opportunity to examine different perspectives and contexts as they all have their own unique history, management and strategic approach to tourism. For the purposes of the thesis, the South West also represented a manageable size for data gathering and stakeholder engagement.

[23] Climate South West (UK) website and resources for tourism businesses: http://climatesouthwest.brightcraft.co.uk/casestudy

Figure 3.1: South West region and the key destination areas covered by the study

Source: South West Tourism Alliance[24]
Permission to reproduce this map has been granted by South West Tourism Alliance.

Potential weaknesses of the study area (although arguably also its strengths) could be the positionality of the researcher in the region (especially in the early stages), the influence and interest of the Tourist Board in the research proposal, and the green ideologies of the region. Implications could include bias, subjectivity, and undue influence of the Tourist Board and researcher on the research findings.

3.3 Quantitative Methodology

Existing techniques and methodological approaches for emissions footprinting in tourism were reviewed in chapter 2 (Literature Review). The studies reflect a range of definitional, theoretical and methodological bases, which have been used to develop the defining principles for the scope of this research and to justify the use of REAP Tourism as an appropriate research tool.

The tool can be used to estimate and investigate the full greenhouse gas footprint (CO_2e) of visitors and can also estimate the carbon (kg CO_2), waste (tonnes), water (litres) and ecological (global hectares) footprints. It can also be used to explore the impact of potential mitigation strategies and identify where to focus emissions

[24] Regional map retrieved on 31/10/15 http://www.swtourismalliance.org.uk/about-us/our-region/

reduction efforts at a regional and destination level through scenario modelling. The design aligns with the Greenhouse Gas Protocol[25] and draws on the review of existing studies and reflects several methodological and theoretical refinements (discussed in the following sections).

3.3.1 Formation and structure of REAP Tourism

The research applied the Resource Energy Analysis Programme for Tourism (REAP Tourism), a bespoke tourism footprinting and scenario tool, designed and produced in 2009 by South West Tourism (SWT) and the Stockholm Environment Institute (SEI). The history of REAP Tourism is summarised in Figure 3.2, which illustrates the development and testing stages of the tool. The project commenced in August 2008 and Version 1 of the software tool was completed in February 2009. The project built on the data collected and lessons from an initial tourism footprint study undertaken by South West Tourism in 2008, using the SEI's 'REAP' tool designed for residents. REAP Tourism runs independently of the original REAP software.

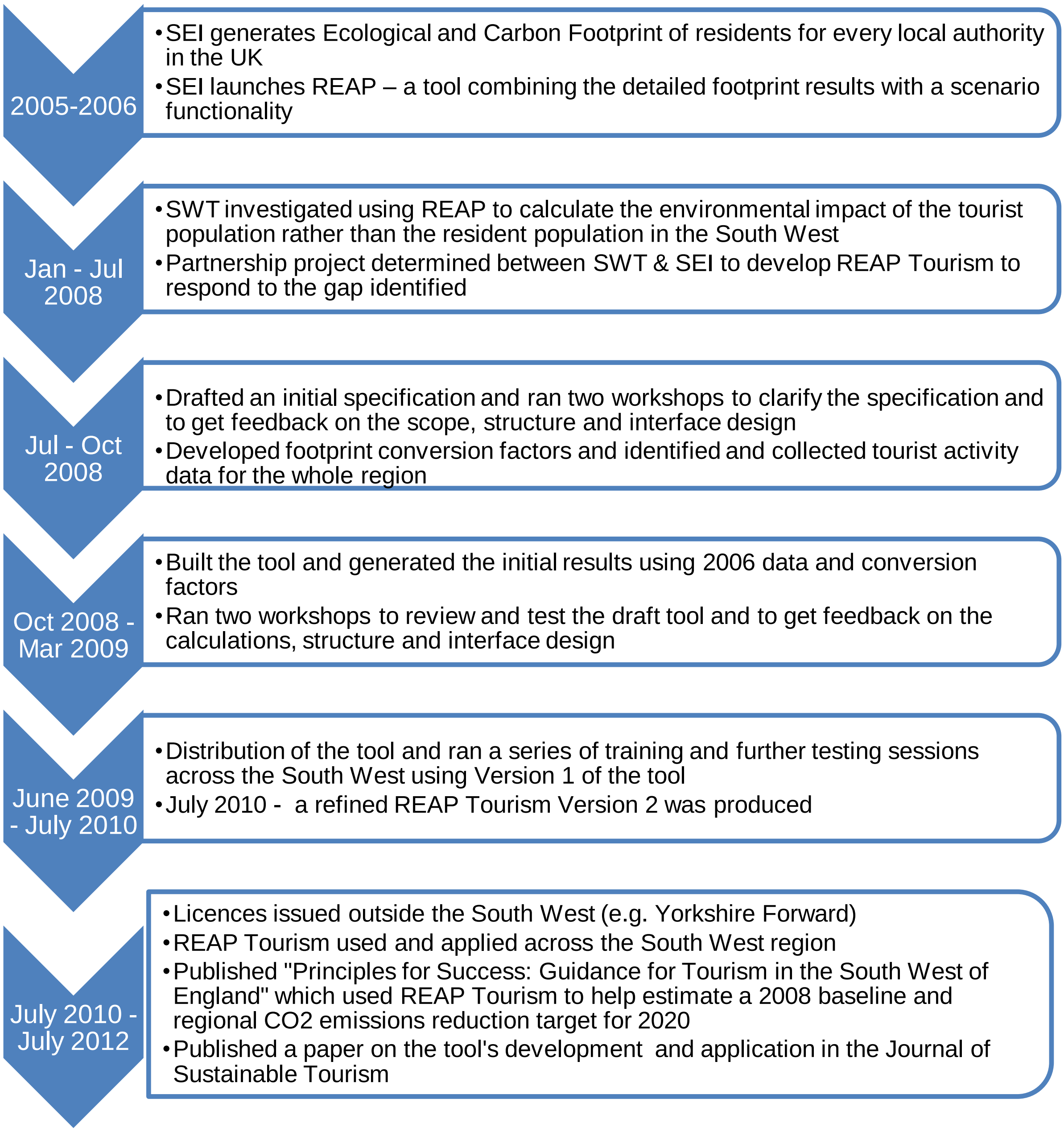
Using complementary elements of the methodology SEI used to create the original REAP software tool, and tourism expertise and tourism data, a new bespoke tourism software tool was designed to address tourism issues. The primary focus was to produce a user-friendly tool that could:

- Identify areas of visitor behaviour with a high environmental impact;
- Demonstrate the impact of attracting different types of visitors;
- Explore the impact of promoting particular visitor behaviours;
- Understand the impact of tourism in the context of lifestyles as a whole.

[25] The foundation for greenhouse gas standards and programmes throughout the world, including the International Standards Organisation and The Climate Registry (World Resources Institute, 2001). It covers the accounting and reporting of the six greenhouse gases covered by the Kyoto Protocol.

The tool was developed by Whittlesea and Owen (2012) and utilises an environmentally extended Input-Output methodology (EEIO) to measure the impact of 'visitor activity'. It was designed as a tool to aid managers of DMOs and tourism practitioners in destinations to investigate and manage the carbon impact of their tourism products and visitors. In terms of positionality, it is important to acknowledge that the researcher has a strong interest in the tool.

Figure 3.2: Developmental history of REAP Tourism



Source: Author

To support the software, several documents were produced. These were a master spread sheet containing all raw data, a user manual, and a metadata document describing the data sources, quality and assumptions. A DVD copy of the tool and documents were distributed to over 100 tourism professionals in the South West free of charge and was licensed to tourism organisations outside the South West. The Intellectual Property Rights (IPR) were divided equally between SWT and the SEI, but SWT's IPR was transferred to Plymouth University in 2012.

The REAP Tourism model built on early carbon footprinting work undertaken by Gössling (2002) and Becken and Simmons (2002), and responded to a research gap identified in a report for the Department of Environment, Food and Rural Affairs on mapping evidence and trends in sustainable tourism (SQW Consulting, 2007). The report suggested a model should be developed to measure the environmental footprint of the UK's tourism industry, by different visitor types and sector components. A description of the model, the technical aspects and some initial research findings are presented in the Journal of Sustainable Tourism *Special Issue* on 'Scenario Planning for Sustainable Tourism' (Whittlesea and Owen, 2012). The tool can be used to estimate both the full greenhouse gas (CO_2e) and the CO_2 footprints for a destination, to quantify a baseline and to understand the contribution of different tourism components to emissions. The model accounts for direct and indirect emissions (where practicable), provides relative and absolute values, looks at regional and destination geographies, and explores different visitor types and profiles. REAP Tourism also has functionality that allows scenario planning.

3.3.2 Scope and detail of REAP Tourism

The defining principles for the design of the REAP Tourism tool were:

1. To measure the impact of the tourist/visitor (consumption) rather than the industry, but include relevant industry components (production) in the structural life-cycle design;
2. To measure full supply-chain emissions, including direct and indirect;
3. To measure the six greenhouse gas emissions in line with the Kyoto Protocol;
4. The tourism system-boundary will be clearly defined and will include aviation and services used by tourists and residents alike;
5. To estimate emissions for a region and the subsequent administrative boundaries within, allowing comparability and benchmarking;
6. To consider day, domestic and overseas visitors;
7. To calculate total and relative interpretations of the visitor impact results;
8. To combine local and national data (bottom-up and top-down approach) and use data and emission factors[26] for the same year;
9. To apply a consistent methodological approach and ensure data are transparent and highlight assumptions.

The following sections provide more detail on these principles and how they were applied, and include defining the footprint, determining what comprises visitor impact, identifying boundaries (geographic and footprint), clarifying the data and conversion factors, tool design, development and functionality, and its limitations .

3.3.2.1 Defining the 'carbon footprint'

The 'greenhouse gas' footprint was defined for this research as the total direct (on-site, internal) and indirect (off-site, external, embodied, upstream and downstream)[27] greenhouse gas emissions caused by an activity or life cycle of a

[26] A representative value, that relates the quantity of a pollutant released to the atmosphere, with an activity associated with the release of that pollutant (EPA, 2015). Emissions factors are used to estimate greenhouse gas emissions, by multiplying the factor with activity data.
[27] Emissions are divided into three 'scopes' based on how much control an individual or organisation has over them. Scope 1 covers all direct emissions released from activities and sources under direct control e.g. a private car. Scope 2 covers indirect 'energy related' emissions associated with the use of energy such as electricity, but occur at sources which are

product, including goods and services in line with the description provided by Galli et al. (2012). The greenhouse gas ‘footprint’, is measured in mass units (kg, tonnes, mega tonnes). If it only applies to carbon dioxide, CO_2 is used as the descriptor, but if other greenhouse gases are included CO_2e is used, referring to the mass of CO_2 equivalents. CO_2e is calculated by multiplying the mass of the gas by global warming potential factors to make them comparable (Galli et al., 2012). The six greenhouse gases identified in the Kyoto Protocol are included: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFC), perfluorocarbons (PFC) and sulphur hexafluoride (SF_6).

3.3.2.2 Defining visitors and visitor impacts

REAP Tourism uses a consumption accounting methodology (Wiedmann and Minx, 2008) that defines impact as the total set of greenhouse gas (CO_2e) emissions caused by an organisation, event, product or person (Whittlesea and Owen, 2012). When accounting for emissions REAP Tourism’s ‘CO_2e Footprint’ measures the direct energy but also includes indirect supply chain emissions involved in the production of food, consumable goods and services. When the review of tourism footprinting studies was undertaken (see Table 2.4), only one study in Hawai’i accounted for a full greenhouse gas footprint of visitors (Konan and Chan, 2010).

REAP Tourism estimated visitor impact on a total and per visitor night metric as well as providing annual totals. This means the volume of impact can be compared as a measure of impact intensity, and the relative impacts of different holidays and choices can be profiled. REAP Tourism can also be used to consider impact over time frames shorter than a year, so that the effects of events, peak season and public holidays can be explored.

not directly owned or controlled. Scope 3 covers all ‘other indirect’ emissions that are a consequence of actions, but occur at sources which are not owned or controlled (other than Scope 2) such as suppliers.

REAP Tourism used the IPAT equation (Ehrlich and Holden, 1971) as a starting point to consider the impacts of tourism. This describes environmental impact (I) as related to a combination of: population (P), affluence (A) and technology (T): I = PAT. To understand the full impact of tourism (I), the volume of visitors must be considered (P), the activities they take part in and the products they consume (A) alongside the energy intensities of the tourism activities and the way the products are produced (T). Using this framework, the methodology and REAP Tourism tool was developed. REAP Tourism assigns impact to the tourists themselves (consumption) and not to the tourism businesses (production), and only includes expenditure by visitors at their destination. Net impact is not considered (recognising that when visitors are abroad, they are not generating impact in their own country), although the results could be adapted accordingly if comparable data were available. From a global accounting perspective, this net impact is an important consideration and should be incorporated.

REAP Tourism used the UK's Department for Culture, Media and Sport (DCMS, 1998) definition of a visitor: anyone on an irregular visit to the region spending more than 3 hours there. Local residents can be day visitors, but if they are making a regular shopping trip, or attending their regular place of work (which could be to serve tourists), they are excluded. Overnight visitors are staying overnight in the region in both free and paid accommodation. REAP Tourism also includes international air travel and shipping impacts of visitors because the choice of destination and transport mode are areas where a region has some influence, particularly in the way it markets itself. In addition, radiative forcing is taken into account (UNWTO, UNEP and WMO, 2008) by increasing the impacts from air travel by a factor of 1.9 (DEFRA, 2010).

The impact of visitors using government services is absent from current tourism economic data sets and the tourism studies investigated in the Literature Review (see Table 2.4). This was seen to be important to include because some public services specifically cater for tourists. To put this into perspective, converting Cornwall's annual visitor nights into a metric equivalent to ‘visitor years’ yields a figure (528,000), greater than Cornwall’s resident population (524,000) for 2006 – the baseline year for the study. The corresponding visitor demand on hospitals, local police, water supply, waste treatment, street cleansing, parking, beach cleaning and tourist information offices will have an impact in the local area but will not show in expenditure data. REAP Tourism recognises this impact under the category of ‘services’, using a South West resident daily impact as a proxy (REAP, 2006). The REAP Tourism visitor carbon footprint is categorised into eight broad themes of: accommodation, food, travel, shopping, activities, attractions, events and services (Table 3.4). Tourism carbon footprinting studies do not appear to have taken public services into account, and rarely are activities, attractions and events considered separately.

The sub categories are largely influenced by existing systems of data collection. Accommodation breakdowns from the UK Tourism Survey (UKTS, 2009), the UN’s COICOP (Classification of Individual Consumption according to Purpose) classification of household’s food and goods expenditure and the classifications used in the Visitor Attraction Survey (VisitBritain, 2007) are used. The activities sub-classification were inspired by Becken and Simmons’ (2002) and informed by the existing structures of tourism data sets.

Table 3.4: Description of REAP Tourism's Eight Themes

Eight themes	What is included in the REAP Tourism CO_2e footprint?
Accommodation	The direct and indirect impact of the energy used in caravans, campsites, campuses, holiday villages, hostels, self-catered properties, guest accommodation, hotels, inns, second homes and the homes of visitors' friends and relatives
Food	The indirect supply chain impacts of food production for catered food from pubs, cafes, restaurants, takeaways and snack shops and non-catered food from supermarkets
Travel	The direct and indirect impact impacts of arrival and return travel and travel whilst staying in the region by different travel modes such as cars, motorbikes, trains, buses, coaches, planes, boats and by foot/bicycle
Shopping	The indirect supply chain impacts of the production of various goods such as recreational items, clothing, furniture, household appliances, personal electronic equipment, jewellery and toys
Activities	The indirect supply chain impacts of a visit to take part in tourist activities such as exploring nature, powered and non-powered water sports, adventure sports and leisure activities
Attractions	The indirect supply chain impacts of trips to tourist attractions such as castles, gardens, churches, theme parks, museums, farms, zoos and views
Events	The indirect supply chain impacts of a visit to a tourist event such as a carnival, circus, sports or religious event, concert, festival, fete or conference
Services	The indirect supply chain impacts of services such as tourist information, cleaning, emergency, breakdown and hospital services, car parking and communication

Source: Whittlesea and Owen (2012), Table 1, p849
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3.3.2.3 Geographical boundaries

REAP Tourism has the ability to model the visitor impact for any geographical area, but for the purposes of this research it is the South West Region. Visitor footprints were estimated and examined for the whole region, the seven counties (and former counties) of Avon, Cornwall, Devon, Dorset, Gloucestershire, Somerset and Wiltshire, and all the unitary and district authority areas within the South West. The model takes a consistent approach to measuring visitor impact at multiple scales, using the same methods and datasets, so that comparisons can be made between areas.

3.3.2.4 Conversion and impact factors

Visitor impact is a combination of the volume of visitors, their demands or activities, and factors which convert the unit of expenditure into greenhouse gas units (kg CO_2e). Conversion factors are required for both the direct emissions caused from the burning of fuel and the indirect emissions embedded in the supply chain of goods and services. The indirect impacts associated with visitors are emissions released within the production supply chain of the product, goods or services consumed by visitors. This means the sum of all the production stage emissions must be calculated and reallocated to the consumer.

Environmentally Extended Input-Output (EEIO) methods can calculate direct and indirect impacts embedded in the production and consumption of goods and services (Miller and Blair, 2009). This is a macro-economic modelling technique that combines an economic modelling framework with data from environmental accounts in a matrix, showing how industrial sectors buy from other industrial sectors. Added to the base of the matrix is additional data about the total impacts associated with each sector of the economy, for example, the statistics reported in the UK Environmental Accounts [28] on the environmental impact of economic activity[29], includes data on greenhouse gas emissions (ONS, 2015).

Alongside the economic matrix is a column showing final demand; the amount of products bought from each sector. In its initial state, the model can demonstrate 'push through' events such as how increases in production could make more products available. In the 1930s, the economist Leontief (1970) demonstrated that

[28] Satellite accounts to the main UK National Accounts and facilitate environmental-economic analyses. They include natural asset accounts (e.g. oil and gas reserves, forestry, land), physical flow accounts (e.g. greenhouse gas emissions, air pollutants, energy consumption, raw materials) and monetary accounts (e.g. environmental taxes, environmental protection expenditure).

[29] Tourism is not recognised as an independent economic sector. However, it incorporates most of the economic sectors identified e.g. energy, consumer expenditure, transport, retail, public administration, accommodation, food services, arts, entertainment and recreation.

if the matrix was mathematically inverted it could be used to explore ‘pull through’ events. Leontief showed how an increase in expenditure on products, reflected in the final demand column, alters the industrial sectors associated with the product and thus how employment in each sector would have to alter to meet this change in demand. This technique can be used to show how emissions change with a unit (one £GBP) increase in expenditure on each product. This, in effect, is the conversion factor showing impact on CO_2e per pound spent.

This technique, described in more detail by Wiedmann (2009), Minx et al. (2009) and Wiedmann, Minx, Barrett and Wackernagel (2006), underpins the workings of the Resource Energy Analysis Programme (REAP) suite of tools developed by the Stockholm Environment Institute (REAP, 2006; Dawkins, Owen and Roelich, 2011). A similar Input-Output (IO) approach was also used by Konan and Chan (2010) to measure CO_2e emissions of visitors to Hawai’i. Table 3.5 gives examples of some of the indirect conversion factors used in the tool which are produced from the IO analysis.

The UK’s Department for Environment, Food and Rural Affairs (DEFRA) publishes emissions conversion factors to convert existing data sources (e.g. utility bills, car mileage, refrigeration and fuel consumption) into CO_2e emissions. These conversion factors include the emissions from both the fuel-burning (direct) and the supply-chain emissions (indirect) associated with producing the fuel. For accommodation, the model additionally needed gas, oil and electricity usage per visitor night for different accommodation types. These data were available from business advisory visits carried out by environmental consultancies for SWT, for example the Green Tourism Business Scheme. For travel, a CO_2e per km travelled is assigned for various transport modes. Table 3.6 provides examples of the direct conversion factors (DEFRA, 2010).

Table 3.5: A sample of the indirect impact conversion factors

Theme	Conversion factor[30]	Unit
Food		
Restaurant food	0.9601	Kg CO_2e per £GBP
Local meat	1.5945	Kg CO_2e per £GBP
Meat from abroad	7.5107	Kg CO_2e per £GBP
Local Fruit and Vegetables	1.3081	Kg CO_2e per £GBP
Fruit and Vegetables from abroad	4.1578	Kg CO_2e per £GBP
Shopping		
Local Clothing	0.3457	Kg CO_2e per £GBP
Clothing from abroad	1.5683	Kg CO_2e per £GBP
Local recreational items	0.8815	Kg CO_2e per £GBP
Recreational items from abroad	3.4347	Kg CO_2e per £GBP
Attractions, Activities, Events		
Exploring nature (the beach)	0.0000	Kg CO_2e per visit
Powered water sports	12.7136	Kg CO_2e per visit
Visiting a theme park	4.3385	Kg CO_2e per visit
Going to a concert	17.5209	Kg CO_2e per visit
Services		
Tourist information services	0.0683	Kg CO_2e per visitor
Hospital services	0.4034	Kg CO_2e per visitor

Source: Whittlesea and Owen (2012), Appendix 2
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Table 3.6: A sample of the direct impact conversion factors

Theme	Conversion factor[31]	Unit
Accommodation		
Natural Gas[32]	0.22504	Kg CO_2e per KWh
Burning Oil[33]	0.30786	Kg CO_2e per KWh
Electricity[34]	0.61199	Kg CO_2e per KWh
Travel		
Car[35]	0.24579 / 2	Kg CO_2e per km
Train[36]	0.06510	Kg CO_2e per km
Bus[37]	0.18891	Kg CO_2e per km
Coach[38]	0.03641	Kg CO_2e per km
Domestic Plane[39]	0.02515 * 1.09 * 1.9	Kg CO_2e per km
International Plane[40]	0.13535 * 1.09 * 1.9	Kg CO_2e per km

Source: Whittlesea and Owen (2012), Appendix 3
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[30] Dawkins et al (2011)
[31] Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting Version 1.2.1 FINAL updated 06/10/2010 Retrieved from Defra website: http://www.defra.gov.uk/environment/business/reporting/pdf/101006-guidelines-ghg-conversion-factors.xls
[32] Emission factors for Gas and Oil calculated on a Net Calorific Value basis
[33] Burning Oil is also known as kerosene or paraffin used for heating systems
[34] Electricity emission factor for 2006. This is based on electricity consumed taking into account transmission and distribution losses
[35] For an average sized car of unknown fuel type. This factor is divided by two to take into account the average occupancy of cars used for leisure and holiday purposes
[36] For national rail travel. This factor is an average emission per passenger for diesel and electric trains in 2007
[37] Emission factor per passenger for a local bus (not London)
[38] Emission factor per passenger for a National Express long distance coach
[39] Include an uplift factor of 9% as recommended by the IPCC Aviation and Global Atmosphere Report (1999) to take into account non direct routes and delays/circling. There is uncertainty over the other non CO_2 climate change effects of aviation (including water vapour, contrails, NOX) which can be accounted for by applying another multiplier. The factor is subject to uncertainty but was estimated by the IPCC to be 1.9.
[40] Similarly, the uplift factor is included here, but the radiative forcing multiplier is not included.

The REAP Tourism model needs the conversion factors, volume of visitors, and expenditure and demand characteristics of visitors across the region. Table 3.7 summarises[41] the data type and the source for each of the eight themes.

3.3.2.5 Tool design and functions

The tool was developed using Visual Basic, a programming language and software development environment created to enable programming and the creation of Windows applications. There are two components to the tool's development. The first is where numbers and subsequent coding are entered, essentially the *mathematics* behind the tool which uses the raw tourism data and conversion factors. The second element is the *graphical user interface*, which reflects the structure and appearance of the tool, which is important for navigation, functionality and usability.

The model was designed around a two layered tab system. The top layer contains two tabs; one allows the user to view or enter data for a single area or year and the second allows graphical comparisons of each of the entries. The second layer of tabs corresponds to each of the eight data themes, so data can be viewed, entered and compared. REAP Tourism has four ways of investigating data about visitors:

- baseline data on the impact by geographic area can be viewed and compared;
- future scenarios can be run on the baseline year;
- visitor profiles can be created and compared;
- event profiles can be created and compared.

[41] The full detail is available in the REAP Tourism metadata document which can be downloaded from http://www.resource-accounting.org.uk/

Table 3.7: Expenditure and demand data sources

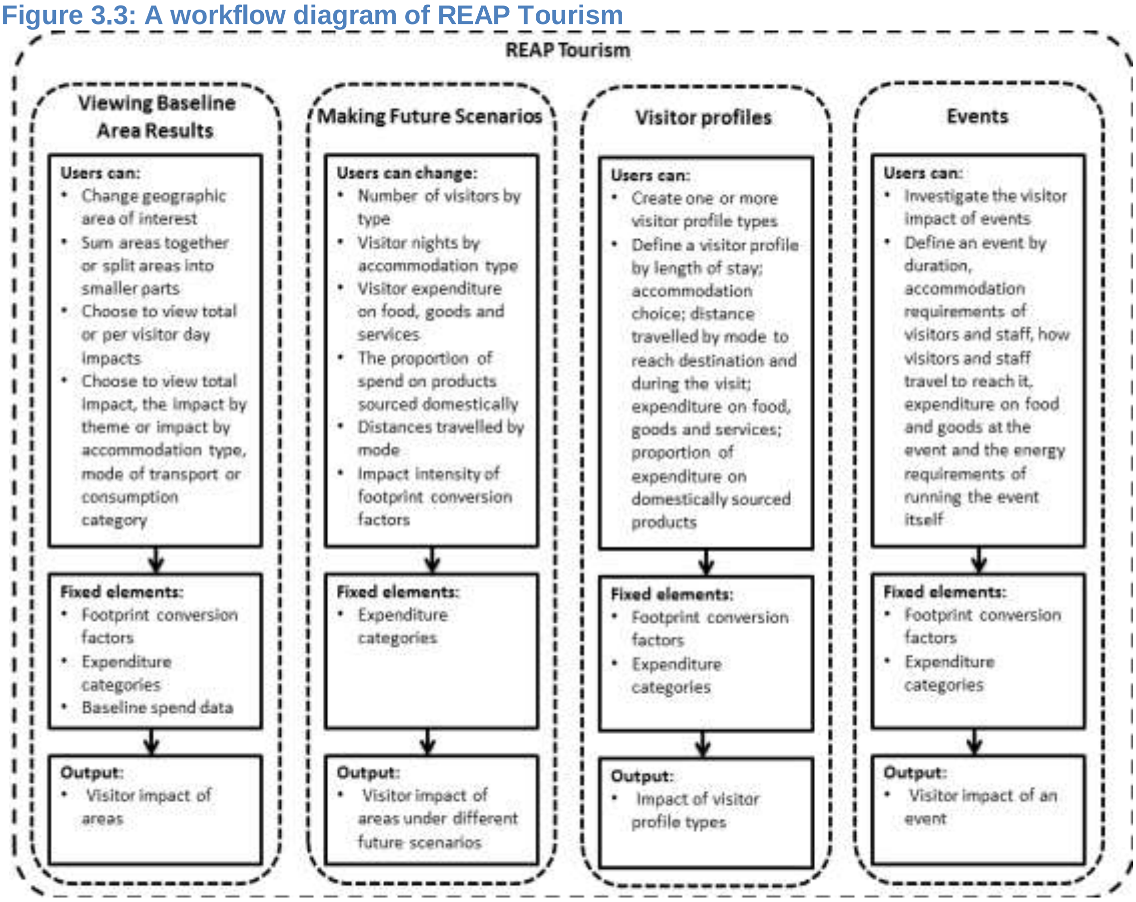
Eight themes	***Detailed description of data type and source***
Accommodation	Visitor nights by accommodation type are derived from UKTS (UK Tourism Statistics) and the International Passenger Survey (IPS) 2006 and are distributed to a district level using visitor volumes and proportions (overseas and domestic) from the Value of Tourism (VoT) 2006 report (South West Tourism, 2008)
Food	Expenditure on catered food is derived from UKTS, IPS and the UK Day Visits Survey (UKDVS) 2005 using the VoT 2006 visitor expenditures. This expenditure is then proportioned by different catering establishments (cafes, restaurants etc) using the UK Food and Expenditure Survey (FES) 2006. Expenditure on all shopping is derived from UKTS, IPS and UKDVS 2005 using the VoT 2006 visitor expenditures. The FES implies that 30% of all shopping expenditure is on groceries so this figure is proportioned accordingly. This expenditure is then proportionally allocated to different food types. Trade data from the EEIO model gives the proportion of expenditure on domestic and imported foods.
Travel	*Air travel by overseas staying visitors* Assign each South West district with a SW entry airport by taking the nearest airport. Use International Passenger Survey 'Travel Trends 2006' to attain visitor origin profiles for each of the main airports within the South West. Use a 'Great Circle Distance' calculation to assign one way total distances travelled. Multiply up by numbers of overseas visitors in each district. *Overland travel by staying visitors in reaching destination* UKTS provides data on the number of visits to each South West county from each of the other UK regions. The road distance from each region to each county was identified and multiplied by visits to calculate total distance travelled. Distances from the South West region to the South West are removed to avoid double counting with travel within the region whilst on holiday. Distances are allocated to different modes based on travel survey data. The county distances are disaggregated to districts by the number of staying visitors. *Travel within the South West by staying visitors during their stay and day trip travel distances* The total distance travelled by staying visitors and day visitors is taken from English Leisure visits Survey (ELVS) 2005. Distances are allocated to different modes based on travel survey data. The county distances are disaggregated to districts by the number of staying visitors and the number of day visitors.
Shopping	Expenditure on all shopping is derived from UKTS, IPS and UKDVS 2005 using the VoT 2006 visitor expenditures. The FES implies that 30% of all shopping expenditure is on consumable goods so this figure is proportioned accordingly. This expenditure was then broken down by the different types of goods (see meta data document). Excludes groceries (see food section). Trade data from the EEIO model gives the proportion of expenditure on domestic and imported goods.
Activities	Proportion of visitors who took part in each activity type taken from ELVS (2005)
Attractions	Visitor numbers by attraction type taken from Visitor Attraction Trends (2006)
Events	Proportion of visitors who attended each event type taken from ELVS (2005)
Services	Impacts are multiplied by volume of staying and day visitors taken from VoT (2006)

Source: Whittlesea and Owen (2012), Appendix 4

The input requirements, fixed elements and outputs of these pathways are summarised in a workflow diagram of REAP Tourism in Figure 3.3. When viewing the baseline section, users can select a geographical area and view the input data by theme. The impact results are displayed at the base of the screen and can be changed from totals to ‘per visitor day’.

The scenario section is based on the IPAT equation (Ehrlich and Holden, 1971), allowing the user to alter the volume of visitors, their expenditure or demands in relation to the eight themes and finally the impact intensity of the conversion factors. The visitor and event profile sections allow the user to describe the character of expenditure for particular visitor types, and the impact of visitors, operations and staff involved in a particular event.

Figure 3.3: A workflow diagram of REAP Tourism



Source: Whittlesea and Owen (2012), Figure 1, p852
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3.3.2.6 User engagement and practical application

The conception stage of design identified that the model needed to be user-led and informed, to ensure appropriateness and accessibility for tourism practitioners involved in decision making, strategy formulation and destination management. Once the outline specification had been determined, an initial stakeholder workshop was held to gain input into the tool's development, with two further open workshops in November 2008 that involved a range of tourism stakeholders across the region (private, public and the not-for-profit sector). The purpose was to demonstrate the footprinting tool and gain further feedback on the calculations, outputs, and the user interface.

REAP Tourism (Version 1) was made available in July 2009 for 12 months testing and review and was distributed to over 100 tourism professionals working in and with DMOs across the South West. Feedback was gained through workshops, direct application and user evaluation. Users particularly liked the ability to explore the impact of different tourism components, the flexibility to add their own data, the localised reporting, and district level comparisons. They also found it useful to: apply the modelling to particular events and scenarios; investigate the potential effects of actions and changes and the variety of applications. The tool was described by a Destination Manager from Somerset as “a very useful, well thought out tool”. This thesis used Version 2, released in December 2010, which incorporated improvements to the structure and functionality and updates made after peer review in 2012. Table 3.8 summarises how REAP Tourism has been used and applied by the researcher to inform tourism decision-making processes and strategic plans.

Table 3.8: Practical applications of REAP Tourism

Examples of how REAP Tourism has been applied in the field

The REAP Tourism tool was used to estimate and analyse the carbon footprint of tourism under different future scenarios, to inform the Steering Group preparing the South West Tourism Alliance (SWTA) 'Principles for Success' document (South West Tourism Alliance, 2011). The research led to the final document identifying CO_2 reduction as a regional headline indicator for tourism success, alongside visitor expenditure (p11) and set a reduction target of an 18% decrease from a 2008 baseline (estimated at 10 million tonnes CO_2) by 2020.

The tool was also used to produce a case study which is included in Plymouth's Local Carbon Framework which focused on the carbon footprint of the city's visitor economy (Plymouth's Climate Change Commission, Plymouth City Council and The Department of Energy and Climate Change, 2012, p18). The study estimated and reviewed the impact of the sector on emissions and explores the opportunities and benefits of greening tourism. An open public tourism stakeholder workshop was held in December 2011 to consider the results of the study in the context of the recently published Visitors Plan and, following the presentations, participants were invited to consider and express their views on the issues that arose.

REAP Tourism was used by the South West Regional Development Agency in 2010, as an evaluation tool to assess the low-carbon impact of the South West region's Rural Development Programme for England (RDPE) funded projects for Sustainable Tourism. REAP Tourism was also recognised as one of the most popular examples of good practice shared by the European Regional Network on Sustainable Tourism (ERNEST). The tool was also used to estimate footprints for the *Bournemouth Air Show* in Dorset (Air Festival Symposium, 2010) and the analysis subsequently informed the development of LEAP, a tool developed by Bournemouth University for events. In addition, it was also used to calculate the footprint of the *Boardmasters Surf Festival* in Cornwall (Cornwall Development Company, 2011; Whittlesea, 2015) as part of a pilot project and the outcome led to the development of a *Green Events Guide* for event managers. Application outside of the South West includes footprint and scenario calculations undertaken by SEI for Yorkshire Forward.

Published material includes a journal article (Whittlesea and Owen, 2012), a book chapter (Whittlesea, Hurth and Agarwal, 2015), and a *Green Innovations in Tourism* case study on the tool and its findings for the South West for a 2011 Mintel Report. The development and application of REAP Tourism was also used as an example of implementing low-carbon destinations in the book: Carbon Management in Tourism: Mitigating the Impacts of Climate Change (Gössling, 2011, p224).

3.3.2.7 Limitations of the Tool

The quality of REAP Tourism are clearly determined by the quality of the input data. The data was from 2006, so the tool provided carbon footprint estimates for this time period, but the data could be updated with more recent data sets and conversion factors subject to availability (e.g. 2008 conversion factors have become available). Care should nevertheless be taken using data and conversion factors for forecasting and scenario development that are beyond three years in age (due to relevance and timeliness), although obtaining access to recent data is a challenge in tourism studies. Current climate change literature works with cumulative carbon budgets detailing the global allowance of CO_2e between now and 2050 (Meinshausen et al, 2009).

REAP Tourism assigns environmental impact to visitors' demand for food, goods and services based on visitor expenditure. This approach assumes that for the same product type, a higher priced version has greater impact. In fact, buying higher priced, higher quality items may mean lower environmental impact (e.g. organic products). The consumer may also have less disposable income available to buy further items. Moving towards measuring impact per unit or impact per kilogram of product would help address this issue as IO tables based on physical units are further developed (Girod and De Haan, 2010). It is worth noting that the use of specific external datasets for the modelling automatically incorporates any associated limitations and assumptions resulting from the averaging and aggregation procedures used.

REAP Tourism is relatively comprehensive but nevertheless requires a good understanding of the data, and how it is interpreted and presented. User error and misinterpretation are therefore a consideration. Training and support can help minimise error, but there is still potential for misunderstanding and mistakes in data entry or extraction.

3.4 Modelling Parameters

3.4.1 Stage 1 – Develop and Examine a Baseline Footprint

REAP Tourism was used to estimate and examine baseline 'greenhouse gas footprint' results for the South West and its administrative areas, while the baseline footprint data enabled visitor impact to be examined for a baseline time period. Table 3.9 summarises the objectives and parameters for the baseline footprinting: to provide an indication of the impact of visitors and how this varies in different areas; identify the impacts of different visitor types and expenditure profiles; and highlight the sources of high impact by theme and sub-component for each case study area. The results were used to inform the scenario modelling and participatory workshops.

Table 3.9: Parameters of the baseline carbon footprint analysis

1. Investigate and compare carbon footprints for different visitor types (day, domestic and international) for single and multiple areas across the South West
2. Explore the construction of carbon footprints in different destinations by investigating the proportional contribution of accommodation, food, travel, shopping, activities, attractions, events and services
3. Explore the detailed construction and break down of the sub-components of the carbon footprint for each of the following themes: accommodation, food, travel, shopping, activities, attractions, events and services
4. Examine different visitor expenditure profiles e.g. relative impacts of backpackers, family holiday and a luxury weekend break
5. Present total (tonnes) and relative footprint results e.g. per trip/per visitor day (kg)
6. Compare results with the average 'resident' footprint for the case study areas
7. Measure and explore the footprint composition of different events (Bournemouth Air Show and Boardmasters Festival)

3.4.2 Stage 2 – Develop and Examine Future 2020 Footprint Scenarios

Scenario planning is directly linked to forecasting and can be used as a business planning tool to explore the consequences of change, uncertainty and the outcomes of alternative development pathways. It has been employed in tourism destination planning since the late 1970s, with the emergence of futures research and 'theoretical' and 'process' modelling approaches in the 1980s (Gössling and Scott, 2012). The uncertainty, implications and challenges of low-carbon tourism development make scenario planning and modelling a particularly useful tool and approach.

There are, of course, inherent difficulties with modelling future scenarios, not least the data and assumptions made in the modelling which should be detailed, but also the impact of unexpected natural and human events (e.g. volcanic ash clouds or restricted fuel access from protests). They can, however, provide a useful foundation for conceptualising what a low-carbon tourism future could look like and how it could be reached, so is particularly useful to engage tourism practitioners. It should be noted, however, that scenario modelling is not about making precise predictions, but about creating realistic possible futures (UNWTO and ETC, 2008).

The scenario function of REAP Tourism can be used to explore and investigate different tourism development scenarios, estimating the likely consequences on emissions while considering the dynamics of the tourism system. Scenario modelling can be a "powerful agent for organisational change and is much more management focused than other forecasting methods" and can provide a process for continued learning, adjustment and adaptation (UNWTO, 2008). Once the baseline carbon footprint was examined and the areas of highest impact were identified, future scenarios were explored to investigate how tourism emissions could be reduced.

REAP Tourism was used to model different scenarios, informed by quantitative and qualitative data from a range of sources to construct alternative plausible futures. These included the impact of different levels and types of growth, the impact of mitigation strategies, the identification and assessment of alternative low-carbon tourism pathways and where to focus emission reduction efforts for tourism at the destination level to achieve greatest impact. Investigations examined whether it would be possible to achieve growth and emissions reductions and covered both traditional supply-side measures/interventions and demand-side measures, considering:

- existing tourism research and trends;
- current and proposed visitor profiles;
- different destinations;
- current and planned policy/strategy.

Modelling different scenarios was used for two main purposes. The first, was to investigate how the carbon footprint of an area might change in the future based on perceived or projected changes in numbers, spending patterns, tourism practice and changing markets. The second was to investigate if the carbon footprint of visitors could be reduced by 34% from the baseline in line with the national 2020 emission reduction targets. The scenario analysis helped to consider and evaluate the effectiveness of different interventions, technical measures and behaviour change.

Changes were made to three different elements in the scenario function of the REAP Tourism tool. The first, was to alter the number of visitors to an area and/or proportions of different types, for example, reducing overseas visitors and increasing domestic visitors. This automatically changes the number of nights spent in accommodation, food expenditure, shopping and services, distance travelled, visitor numbers to attractions, events and activities. The second was to alter the mix and pattern of data entered into each theme reflecting changes in consumer behaviour and expenditure. For example, through increased camping, reduced stay in hotels, travelling differently and eating out more. The third was to alter the energy efficiency of technological production, for example, to reduce the energy used in accommodation, transport, the products and services consumed.

Scenarios can be created for each area of visitor expenditure, through changes in the amount spent and changes to the products and services used. For tourism management in destinations, it is crucial to examine a range of scenarios which examine and combine economic growth and greenhouse gas mitigation objectives. Scenario modelling and profiling was undertaken for the South West to review, integrate and compare the carbon footprints of the different scenarios detailed in Table 3.10.

Table 3.10: Scenario modelling and profiling

Scenario modelling and profiling	
1.	Changes in visitor numbers and proportional mix of types (day, domestic staying, international staying): • Steady state e.g. the baseline remains the same • Business as usual e.g. 3% growth in line with regional and national targets • Halving growth e.g. 1.5% • Deloitte forecasts (2010) e.g. 4.4% overseas and 2.6% domestic visitors • 3% growth, but replaces 3% overseas growth with an additional 3% domestic growth
2.	Changes in visitor behaviour: • Increasing length of stay, reduce km travelled, increase local procurement • Examining and profiling different trips and visitor profiles (greener choices) • Examining and profiling the impact of different events
3.	Changes in technology and business practice: • Greener business practice e.g. reduce carbon intensity of businesses • Greener travel practice e.g. reducing the carbon intensity of vehicles
4.	Comparing and combining scenarios: • Mitigation policies • The range of tourism growth scenarios (as per scenario 1.) • Combining mitigation and growth

Source: Author

The quantitative and qualitative data used to inform the scenario modelling is presented alongside the quantitative results in section 4.6.

3.5 Qualitative Methodology

This section introduces the qualitative methodology employed to explore the modelled carbon results with tourism stakeholders. A qualitative research approach was chosen as this research is exploratory in nature and needed to use flexible methods to enable participant engagement (Boeije, 2010). Qualitative analysis is defined by Corbin and Strauss (2008) as a "process of examining and interpreting data in order to elicit meaning, gain understanding, and develop empirical knowledge" (p1) and is about "hypothesis generating rather than testing" (p25). The purpose of having a significant qualitative element to this research was to facilitate tourism stakeholder engagement and consideration of the quantitative carbon data, to investigate perspectives and to explore the potential challenges and opportunities for destination management.

Combining quantitative and qualitative methods has several advantages for research design (Creswell, 2013). Becken and Patterson (2006) assert that quantitative accounting of emissions is a critical first step in climate change mitigation, but qualitative research into the roles of tourism stakeholders and the potential to change behaviour, is essential for the development of more sustainable forms of tourism. Equally, it can be productive the other way around, using qualitative research to identify themes for quantitative testing (Creswell, 2013). In social science, this complementary integration of methods and data for the same research subject is defined as methodological and data triangulation, which helps not only with validation, but to deepen and widen understanding (Berg, 2001). In the context of this study, qualitative research was utilised to give more depth and exploration to the quantitative modelling with different questions posed around the research subject.

Qualitative research in tourism is not just about methods, but also the potential to facilitate dialogue and create a participatory and critical approach to social enquiry and knowledge production (Phillimore and Goodson, 2004). The qualitative route can help to deconstruct problems and interpret data and phenomena through consideration of people's perspectives, values and meanings (Phillimore and Goodson, 2004). Consequently, the use of qualitative methods enables the researcher to evoke responses that are unanticipated, more detailed and meaningful (Mack, Woodsong, MacQueen, Guest, and Namey, 2005). Qualitative research actively promotes participation (Gibbons et al, 1994) which is consistent with embracing inter-disciplinarity and encouraging applied and socially accountable scientific methods to co-produce knowledge where "facts are uncertain, values in dispute, stakes are high and decisions urgent" (Funtowicz and Ravetz, 2003, p1).

Participatory techniques can help facilitate stakeholder engagement and are seen as particularly relevant for the persistent, complex and subjective nature of sustainability problems (Whitmarsh, Swartling and Jäger, 2009). The qualitative methods enabled the researcher to explore the implications, opportunities and challenges of carbon measurement and management at the destination level, whilst encouraging and facilitating co-transformative learning and the co-production of knowledge. These objectives, which are aligned to the research questions, provide a framework for the qualitative inquiry, and inform the research design, delivery and analysis.

3.5.1 Stakeholder Participation

The challenges of tourism and climate change mitigation are complex, dynamic, ambiguous and subjective, so stakeholder participation plays an important role in knowledge production, legitimising ideas and to develop responses. It allows the researcher to draw on diverse knowledge and to explore issues of convergence and divergence around understanding, interpretation, relevance and meaning (Whitmarsh, Swartling and Jäger, 2009). The process itself can help develop and promote learning, trust and ownership amongst participants of any subsequent decisions (Pahl-Wostl, 2002). Studies suggest that this is especially the case for environmental management, but the quality of the decisions is heavily dependent on the quality of the process (Reed, 2008; Whitmarsh, Swartling, and Jäger, 2009).

There are substantive, normative, pragmatic and instrumental reasons for undertaking stakeholder participation, especially if values and preferences in decisions about the future are to be explored (Reed, 2008; Whitmarsh et al., 2009). It has been suggested that the process can help to identify a common long-term vision, and pathways, scenarios, policies and evaluation mechanisms to achieve that future (Rotmans, 2005). In addition, they can lead to conflict, which is not necessarily negative as it can help identify areas of dispute and identify the parameters of debate. Some drawbacks for stakeholder participation include: the time and care needed to do it well; issues of diplomacy; and if the purpose and remit of engagement is unclear it can raise false expectations (Irvin and Stansbury, 2004; Reed, 2008).

It is possible that stakeholders understand and accept the need to reduce tourism's emissions, but they could be unwilling or unsure how they can change behaviour or strategic direction to enable reductions to happen. Here qualitative and participatory methods can facilitate deliberation and institutional and social insight, which can expose inappropriate and contradictory activities and encourage changes in behaviour and direction (Lorenzoni, Nicholson-Cole, and Whitmarsh, 2007). This qualitative stage employs an integrative, participatory and spontaneous approach, a natural 'next step' in terms of the research. It is also a fundamental 'next step' in bridging the science-policy divide and in modelling outcomes developed, or presented sufficiently, to inform strategic tourism planning and stakeholder decision-making at destination level. Reed (2008, p10) suggests that participation should be seen as a process and identifies eight features of best practice from the grounded theory literature. These are described alongside the methodological considerations in Table 3.11 and where practicable these features have been used as guiding principles to inform this research.

Table 3.11: Methodological considerations for stakeholder participation

Features of Best Practice	Methodological Considerations
Stakeholder participation needs to be underpinned by a philosophy that emphasises empowerment, equity, trust and learning	To co-produce learning and knowledge around carbon measurement and management in destinations, stakeholder empowerment was encouraged through the provision of data and the opportunity to ask questions and openly discuss outcomes. The research process, information supplied, and rules of engagement were designed to be transparent, inclusive and equitable to build trust in the researcher and the process.
Where relevant, stakeholder participation should be considered as early as possible and throughout the process	Tourism stakeholders were engaged early in the research process to inform the quantitative stages (1 and 2) as preliminary results were presented at a Strategic Stakeholder Workshop in Exeter (November 2010) and a Visitor Economy workshop in Plymouth (December 2011). These provided initial feedback on the modelling but also proved the value and importance of stakeholder engagement, setting the basis for continued engagement through the participatory workshops and semi-structured interviews.
Relevant stakeholders need to be identified and represented systematically	Tourism stakeholders (individuals and groups) and Destination Managers who could be interested in or affected by the research were identified through existing tourism networks, communication channels, and literature and web searches. The detail on participant recruitment, representation and categorisation is covered in section 3.5.3.
Clear objectives for the participatory process need to be agreed among stakeholders at the outset	The objectives for stakeholder participation in the research were predefined by the researcher and were shared with stakeholders early and throughout the research process. It was not practicable to engage them in defining the objectives.
Methods should be selected and tailored to the decision-making context, considering objectives, type of participants and appropriate level of engagement	The participatory workshop and semi-structured interview techniques and their design were developed to meet the research objectives, provide data, attract a sufficient sample, be professional yet informal, promote dialogue and be appropriate in structure and content in order to engage a variety of tourism stakeholders.
Highly skilled facilitation is essential	The researcher had training with Dialogue Matters before the qualitative and participatory research. The researcher and workshop facilitators also had prior experience of facilitating group work. All facilitators were provided with a written briefing beforehand and were briefed on the day.
Local and scientific knowledge should be integrated	Modelled carbon data and scenario analysis were presented in the workshops to inform deliberation and input. The objective to gather local views and knowledge on the data was shared with stakeholders at the beginning. The presentation was designed to be inclusive.
Participation needs to be embedded in institutional structures	Engaging tourism stakeholders in the participatory process may have influenced their thinking about research and participation from an organisational perspective. Use of participatory workshops in this research might influence the methodological approach for future research projects.

Source: Author, developed from Reed (2008)

3.5.2 Review of Qualitative Methods

There are numerous typologies of, and methodologies for, participation (Reed, 2008), and various participant-oriented methods for obtaining stakeholder views were considered for the qualitative component of this research. These included different interview approaches (structured, unstructured and semi-structured), group discussion, focus groups and observation.

After a review of participatory methods and design (e.g. Tippett, Handley and Ravetz, 2007) and qualitative techniques (Boeije, 2010; Creswell, 2013; Hennink et al, 2011), a mixed-method approach was chosen. The approach utilised a combination of stakeholder workshops to facilitate small-group discussion and semi-structured evaluation questionnaires and interviews to gather individual feedback. The rationale for using these techniques was to maximise the advantages and overcome the limitations of each method through triangulation, but also to provide a strategy for social learning and knowledge acquisition (Creswell, 2013; Whitmarsh et al., 2009). Active stakeholder participation and group dialogue in the workshops enabled the carbon modelling to be reviewed, increased learning, openness and empowerment. The semi-structured interviews provided an opportunity to ask more focused questions, to explore and validate the workshop findings and gather individual responses.

The primary factors for the choice of method were the objectives of the research, the resources available and achieving the desired quality and type of engagement from target stakeholders. Observation (participant and non-participant) as a technique was not appropriate as there were no natural settings, relevant situations or processes to be observed (Boeije, 2010). Questionnaires were discounted because, although they can cover a variety of questions and gain wider coverage, they do not enable dialogue or active participation and would limit interaction with the modelled data.

The use of focus groups aligned well with the research objectives as they:

- focus on specific issues;
- promote interactive discussion;
- engage groups of 6-8 participants;
- utilise a pre-determined group of people (Hennink et al, 2011).

However, they are time-bound, have a limited sample size, the sample is recruited and typically paid an incentive, have limited researcher influence, tend to be formal in nature, can be costly to run, data analysis can be complex, and time constraints can mean few issues are discussed (Hennink et al, 2011). Attractive features of the focus groups were group discussions and the opportunity to collect data from group interaction.

Thus stakeholder workshops, facilitating informal small-group discussions and which attracted a larger number of participants, were the preferred method. In stakeholder workshops, participants are not research subjects but peers voluntarily contributing time and ideas. The process tends to be less controlled and encourages more productive dialogue which could be effective in building understanding (Kasemir, Jager, Jaeger, and Gardner, 2003).

Conventional interview approaches can provide valuable insights into the effectiveness and acceptability of carbon accounting data for tourism from an individual perspective. However, they may not easily allow for or enable interaction with the modelled data, and would not be sufficient used in isolation. They are also time intensive in terms of engaging a reasonable number of participants and do not facilitate open dialogue, especially between stakeholders. However, interviews can have different pre-determined structures, ranging from unstructured (free and in-depth) to structured (standardised interview). For this research, semi-structured 'expert' interviews lent themselves towards gaining individual perspectives from informants with expertise in destination management and allowing all participants to be asked open questions within a flexible framework (Gubrium and Holstein, 2002). Table 3.12 describes the advantages and disadvantages of the chosen techniques in more detail.

A key challenge for both techniques is securing effective stakeholder participation. This can be overcome through the use of appropriate participatory approaches and ensuring the researcher has adequate skills and capacity (Kasemir et al, 2003). The disadvantages of workshops can be overcome by good preparation and non-technical inclusive design with robust exercises and consistent data capture methods (Krueger, 1994; Kasemir et al, 2003). Trained and experienced facilitators were used and were briefed on the workshop format and processes for dealing with conflict. Operational questions were used to inform the content and structure of the workshops and reduce limitations. These were drawn from Krueger's (1994) considerations for focus groups, including: the selection of participants; homogeneity of groups; incentives to promote attendance; securing an appropriate venue; determining the questions to be asked and sequence of the sessions; and identifying suitable facilitators. In addition, determining these characteristics and focussing on the topic were crucial to ensuring the researcher controlled, to a certain extent, the data generated.

To help overcome the disadvantages identified with semi-structured interviews, assistance for the transcription was secured. The researcher had experience and training and actively avoided engagement in discussions, other than asking open questions. The methodological limitations and disadvantages associated with each of the chosen techniques were in part addressed by utilising both methods but the detailed considerations were covered in the methodological design and delivery referred to in section 3.5.3 (stakeholder workshops) and section 3.5.4 (semi-structured interviews).

Table 3.12: Advantages and disadvantages of the chosen qualitative methods

Method	Advantages	Disadvantages
Stakeholder Workshops	• Participants can react to and build upon the responses of other group members • Potential to break down the researcher-researched power relationship; empower participants and encourage a more collaborative process of knowledge production • Flexible and relatively easy to conduct • Ability to explore how participants value and define key concepts or issues • Ability to allow participants to rationalise views and experiences / expose reasoning behind perceptions • Potential to present information consistently to all and use visual stimuli • Time efficient and relatively low cost • Facilitate communication • Partnership and participation encourage growth and empowerment and bring authenticity to the research • Good for testing new ideas	• The influence of the peer group and/or dominant individuals may bias the results, increasing the potential for social desirability bias • Trustworthiness, dependability and credibility needs increased attention • Needs highly skilled facilitation and thorough planning • Empowerment of previously marginalised groups may have unexpected and potentially negative consequences • Need to ensure a balance and identify appropriate representatives for participation • Incorporating different and competing interests • Can reinforce existing privileges and group dynamics may discourage minority perspectives from being expressed • Could become a 'talking shop' • Many stakeholders may not have sufficient expertise to engage meaningfully in technical debates • Limitations of confidentiality • False consensus
Semi-structured Interviews	• Gain information on peoples' personal experiences and feelings • Gain in-depth knowledge of issues and relationships, for example on beliefs, motivations, reasons and actions • Useful for sensitive topics and cross-cultural or multi-cultural research • Get contextual and process information • Can react and respond to interviewees • Opportunity to seek clarification • Inclusive for people who have difficulty reading or writing	• Small sample and number of participants • Time-consuming and can be expensive • One to one interaction, so no feedback or interaction with others • Does not easily allow for or enable interaction with the modelled scientific data • Needs interview skills to establish rapport, probe, listen, react to interviewees and motivate • Needs flexibility to adjust and change topic order in interview guide if required • A lot of transcription is needed • Risk of interviewer effect on responses of the interviewee

Source: Author, developed from Casapia, Joseph,and Gyorkos, (2007); Reed (2008); and Boeije (2010)

3.5.3 Semi-structured Stakeholder Workshops

3.5.3.1 Participant Identification and Recruitment

The workshops targeted tourism stakeholders involved in, or influencing, tourism decision-making and management in sub-regional tourism destinations in the South West. This group was targeted in line with the objectives of the research and the criteria were designed to attract the silent minority as well as more interested participants. Where practicable, the following inclusion criteria were considered:

- a role or interest in tourism decision-making at destination level;
- affected by, or having a stake in, the discussions or outcomes;
- having over three years' involvement with the tourism sector and the 'destination';
- ensuring a balance of interests and representation e.g. private, public and voluntary.

Strategic tourism stakeholders were identified through existing tourism networks within the South West region, with support from respective DMOs. Stakeholders were also identified through 'word of mouth'. Once participants were identified, personal invitations and promotional material were distributed, outlining the research, its aims, objectives and potential benefits. The invitation list included private, public and voluntary representation. Institutions invited included:

- tourism associations;
- destination management organisations;
- local tourism partnerships;
- local government tourism units;
- tourism businesses (e.g. accommodation, attraction and restaurant);
- protected landscapes;
- charities such as the National Trust;
- transport providers (e.g. airport and rail providers);
- lobby groups (e.g. Surfers Against Sewage);
- tourism networks (e.g. CoaST).

Reminders and follow-up emails were sent to encourage attendance and to achieve a robust sample. After stakeholders had registered interest, each participant was emailed pre-workshop information, which included a workshop programme, research information sheet and a consent form to be completed and returned before the research commenced.

3.5.3.2 Sample Size

Samples in qualitative research are often small, as cases are studied intensively and each case typically generates a large amount of information (Boeije, 2010). Samples are often not pre-determined and are selected sequentially linked to data collection and analysis. Sampling in qualitative research typically aims to represent a range of experiences and perspectives as opposed to representing a statistically significant sample of the population (Ziebland and McPherson, 2006). The sample for the workshop recruitment process is hard to determine as invitations were sent out to a wide range of tourism stakeholders, working in or with a DMO in the South West of England. However, there are only nine recognised DMOs in the South West, and stakeholders forwarded the invitation to other stakeholders. In total, 60 invitations were issued. The target sample for the workshops was between 15-30 stakeholders to ensure an effective session and to fit with venue capacity. The turnout for the Taunton workshop was 16 participants (24 registered attendance) and for Cornwall it was 19 (29 registered attendance). The two workshops led to a total sample of 35 tourism stakeholders who participated in the workshops. A list of the organisations represented at the two workshops is held at Appendix 2.

3.5.3.3 Predetermined Groups

The final attendance lists were used to split participants into manageable groups (3-5 people) in order to mix stakeholders and encourage cross-fertilisation of ideas. The small groups were distinguished using different coloured stars on name badges, correlating to a table and designated facilitator. The venue was set out in tables to encourage small-group interaction. The level of homogeneity was also considered when the groups were determined to encourage discussion, but also to ensure varied perspectives. Where practicable, the researcher also tried to gain a gender and organisational balance in each group, so that there was a relatively even spread of industry and local government representation. The participants influence each other through their answers to ideas and contributions during discussion, so the group composition was important.

3.5.3.4 Workshop Design

The semi-structured stakeholder workshops were used to present the REAP Tourism baseline and scenario results, and to explore their implications for tourism management based around the three research questions. Of particular interest was exploring how effective carbon footprinting could be as a measure and tool, to inform and engage tourism stakeholders in the transition to a low-carbon tourism economy. As a result, the workshops were structured to provide a two-way exchange of information. Workshops began with a presentation on the quantitative modelling data and then an opportunity for questions. This was followed by opportunities to discuss, debate and feedback in small groups. The aim was to facilitate mutual learning and enable participants to engage in and observe the process of knowledge production. The workshops used flipcharts and post-it notes, free-comment zones and sticky stars for prioritisation to capture the results and ensure that outcomes were immediately visible.

Two 'participatory' stakeholder workshops were delivered. The workshop for the northern part of the region was held at the Tiverton Park Hotel, Taunton on the 24^{th} April 2013. The workshop for the southern part of the region was held at Heartlands in Pool, Cornwall, on the 9^{th} May, 2013. The workshops were free for participants and each ran in the afternoon for three hours, starting with lunch and networking at 1pm and finishing at 4pm, with a minute refreshment break. Each exercise ran for no longer than 20 minutes to keep participants engaged. The workshops mainly comprised group exercises until the end, when participants were asked to complete a short evaluation questionnaire.

Each workshop was organised and promoted in conjunction with local DMOs (or equivalent). It was hoped that this approach would encourage participation and raise the profile of the research, but it was also recognised that for some stakeholders the close association with the DMO may have been a barrier. Samples of the promotional material are shown in Appendix 3.

3.5.3.5 Moderation

The workshop was facilitated and moderated by the researcher, who attended a three-day Dialogue Matters training course in preparation. During workshops, each table had a facilitator with previous research experience who was competent and confident in facilitation. All facilitators were issued with briefings several days before (see Appendix 4) and were briefed before the workshop to ensure consistency in the sessions. The facilitators had an important role to play in maintaining momentum, keeping to time and task, promoting an inclusive atmosphere, encouraging group interaction, and recording notes and key points from each exercise. The facilitators were instructed not to get involved in the discussions or to contribute personal views.

Tourism and climate change mitigation as a research area has inherent contradictions and associated value systems (see section 2.2), which can be healthy if dealt with appropriately and can reveal important information. However, it was important to have mechanisms to mediate and manage conflict. At the beginning of the session and as part of the introduction and presentation, participation guidelines were shared (see slide 5, Appendix 5) and a copy was made available on each table. Participants were given the opportunity to add anything they thought was missing. The ‘ground rules’ and facilitators helped to keep the groups on track and the guidelines could be referred back to if the group entered into contentious discussions.

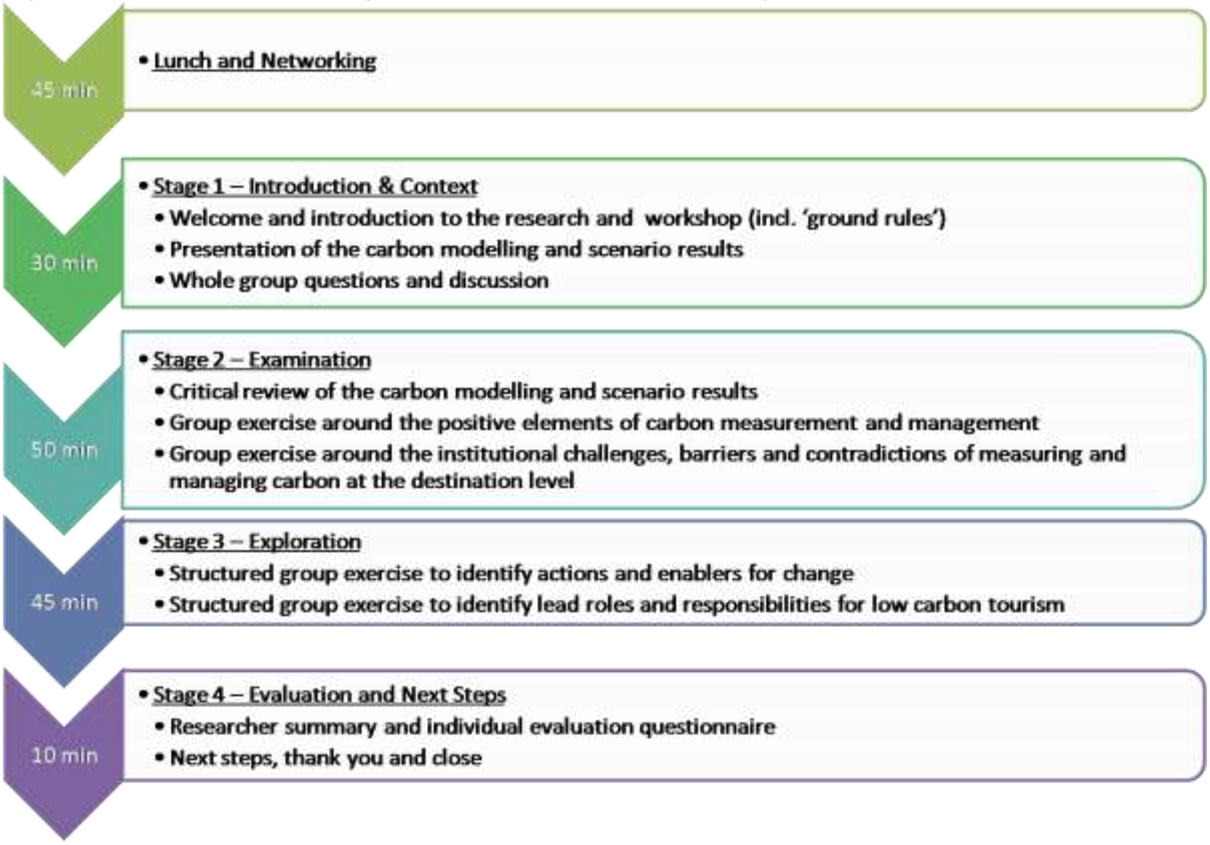
Whilst the exercises were taking place, the lead researcher moved between tables to ensure everything was on track, provide clarity and support where necessary, and deal with sensitive issues and potential conflicts of opinion. The lead researcher monitored how each group was proceeding and intervened if required by refocusing on the task and helping the group to move on. The individual table facilitators had been briefed beforehand to ensure they were aware of techniques and prompts to keep the group interaction balanced and flowing. This approach seemed to prevent conflict from arising.

3.5.3.6 Workshop Programme

The workshop programme aimed to promote a two-way exchange between the researcher and the stakeholders and to enable them to familiarise themselves with the research findings, whilst at the same time providing knowledge and expertise to shape the research. The main purpose was to facilitate stakeholder discussion around carbon measurement and management in destinations.

The workshop structure is presented in Figure 3.4. This outlines the four stages used to explore the topic, promote discussion and draw out participants’ views and experiences. Stage 1 provided an introduction to the workshop and presented the modelling results, providing time for questions and clarification. Stage 2 encouraged examination of the results, stakeholder reflection and identification of the opportunities and challenges for low-carbon tourism. Stage 3 explored how the results could be improved and how carbon management could be integrated into destination management practice and what could motivate and engage tourism stakeholders. The final stage summarised the workshop, highlighted the next steps of the research process, and encouraged completion of individual evaluation forms.

Figure 3.4: Structure and stages of the stakeholder workshops



Source: Author

The detailed programme used by the researcher and facilitators is shown in Appendix 6. It describes timings, responsibilities, the activities and techniques employed, resources required and the role of the facilitators in each of the stages. A draft full programme was shared with supervisors and research colleagues and was adjusted to ensure the timing and material were appropriate. The draft programme and exercises were also reviewed after the Dialogue Matters course on 'participatory knowledge exchange' (March 2013).

3.5.3.7 Data Collection and Reporting

Two complementary methods of data capture were used to aid validity, reliability and group dynamics. The first was a tape recorder on each table to record discussions for transcription. In addition, the facilitator captured views and outcomes using flipchart sheets, post-it notes and sticky stars for prioritisation. These were chosen to ensure that the outcomes were immediately visible and that there was an ongoing, visible record for the group to revisit and amend as required. Each group was working to the same structured exercises, templates and timing.

The recordings provided a complete and accurate record of what was said by different individuals and provided context. It also captured differences of opinion and detail that may not be captured by the facilitator. However, due to the nature of the workshops and the number of groups in one room, it was not known how clear the recordings would be for transcription. In addition, the recorder could not capture the outcomes from exercises where individuals were writing their ideas down on post-it notes and may not have verbalised them. The table recorder may also have led to a focus on the recording and might have restricted conversation, had there not also been a flipchart focus and record (May, 2001).

The views recorded by facilitators on the flipcharts were aimed at capturing key issues and points emerging from the group discussions (individual and collective). Through this process, facilitators could check meanings had been interpreted accurately and those present were happy with what was recorded. This provided an element of transparency and flexibility, as it enabled the group to revisit the recorded data as required. Observing the tracked comments also encouraged conversation and ideas. In addition, the researcher took notes on key observations, issues and comments. An ‘ideas and comments’ board was also available for participants to note any additional views, concerns or suggestions using post-it notes.

3.5.3.8 Semi-structured Evaluation Questionnaire

At the end of the workshops, participants were encouraged to complete an evaluation questionnaire, resulting in 34 completions (97% response). The structured evaluation questionnaire is in Appendix 7 and comprised ten questions to gather feedback from the workshop participants on their individual perspectives (not influenced by the group setting). The questions explored whether the workshops accomplished their objectives, encouraged reflection to examine what knowledge participants gained and how they may incorporate any learning into their work. The questionnaire was also used to get feedback on the workshop with regards to improvements and to capture participants' views and experiences of the participatory process and knowledge development. Questions also sought perspectives on whether tourism's carbon footprint should be measured and monitored, whether it was deemed important, identified the top two challenges, opportunities and actions, and provided the opportunity for any additional comments they would like to make, or felt they could not make in the group environment. This approach helped to validate the workshop results quickly and easily, and could be analysed more objectively than the qualitative outputs (Popper, 2004).

3.5.4 Semi Structured Interviews

3.5.4.1 Selecting Interviewees

Research suggests that decisions to move towards low-carbon operations are usually made at the highest level of management from a study of FTSE100 companies (Okereke, 2007). Applying this theory to destination management, the target audience for the interviews was identified as the Chair, CEO, Strategic Director or Manager of Destination Management Organisations (or their equivalent) and other strategic bodies with influence on them. After the two workshops, 16 semi-structured 'expert' (Gubrium and Holstein, 2002) interviews were carried out.

The sample of participants selected for the interviews was obtained using a mix of purposive and snowball (also known as network) sampling. Initial sampling started with the purposeful selection of three main strategic tourism organisations: The South West Tourism Alliance, Visit Cornwall; and VisitEngland. These cases were selected because they were identified in the workshops as strategic stakeholders with power and influence in the area of study. Further DMOs and interviewees were then identified using the network method which is particularly useful for sensitive topics and involves asking participants for suggestions of further participants who are subsequently approached (Boeije, 2010). It became apparent that the research was reaching saturation at interview number 13, when repetition was occurring and nothing new was coming from more data, so three further interviews were undertaken to be certain. Three of the interviewees had also attended one of the research workshops.

3.5.4.2 Interview Design

The interviews were undertaken between May and August 2013 and participants self-selected following a written invitation. Each interview ran between 40-60 minutes. Due to the geographical area covered by the South West and limited resources, nearly all the interviews were conducted by telephone, with the exception of one which was ‘face to face’ due to circumstances and proximity. Research suggests that the impact of the interviewer in telephone interviews tends to be less-pronounced than those undertaken in person, as there is no non-verbal communication (Tashakkori and Teddlie, 1998). Critiques of the phone method include the inability to observe peoples’ reactions, to determine how comfortable they are with the questions, or how truthful they are being (Opdenakker, 2006). It can also be intrusive for some people and time sensitive, so it can be hard to encourage interviewees to elaborate on their responses.

The interviews explored the outcomes of the workshops to gain further clarity and were designed to investigate individual perspectives (free from the group dynamics), and to examine some specific areas further. The semi-structured interviews comprised eight main questions, with sub-questions determined after the workshop outcomes had been analysed. These are presented in the interview guide in Appendix 8 and include some slight alterations made to rephrase the questions and their order after testing with colleagues.

The interview questions followed a funnel structure, beginning with broad questions which became more specific (Tashakkori and Teddlie, 1998). The main focus was to gain a deeper understanding of the current carbon mitigation and measurement activity within destinations, investigate views on carbon accountability, identify how responsibility could be assigned and progress monitored, and to examine the perceived relationship between carbon impact and tourism growth. The questions were designed to meet the research objectives but also to be of interest to the participants and use appropriate language and terminology (Boeije, 2010). All participants were encouraged to talk about their experiences but sometimes the order would change to suit the interview. The nature of the questions encouraged openness and allowed deeper investigation into each area, through further prompts and questioning determined by responses. Detail was obtained by asking for examples or clarity on points raised.

3.5.4.3 Recording and transcribing

Raw data from the two workshops, evaluation questionnaires and the semi-structured interviews were recorded and transcribed to protect the anonymity of participants. The researcher transcribed the workshop data from the flipchart sheets and post-it notes and entered the evaluation questionnaire results into Survey Monkey. Internal assistance with transcription was secured for the audio recordings from the workshops and interviews. This was due to time limitations but care was taken to ensure participant confidentiality was maintained by using a colour and number coding system and ensuring the names of people, places and institutions were concealed so that the participants and their organisations could not be identified.

The two researchers who helped with the transcription also took part in the Cornwall workshop as facilitators, so had insight into the research and Plymouth University's Ethical Principles. A large amount of data was generated from the qualitative research, including: the session notes, post-its and transcribed recordings from ten workshop sub-groups; 32 workshop evaluation questionnaires; and 16 transcribed semi-structured interviews. To prepare data for analysis, some data management was needed in terms of proof-reading and correcting transcripts against original recordings. Transcribed data were organised in NVivo and the data and audio recordings were backed up in Word and Dropbox folders.

3.5.4.4 Data Analysis - Tools and Techniques

Interpretation is a process that produces meaning from experiences, text, objects or events from which inferences can be made (Denzin, 1998; Boeije, 2010). The acquired knowledge is determined from examining the components, properties and dimensions of the data and implies an understanding of the research outcomes from the participants' perspectives (Corbin and Strauss, 2014). The analytical approach used in this study was sequential, in that it was linked to the phased data collection and preliminary analysis commenced shortly after each data collection phase (Boeije, 2010). This enabled the researcher to validate, clarify and develop concepts alongside capturing which increased sensitivity to the topic and provided direction (Corbin and Strauss, 2008). This helped to increase the depth of preliminary analysis and supported a grounded theory approach.

The literature review provides an outline framework for the analysis (Boeije, 2010). However, grounded theory was used in this study to interpret the empirical data, identifying patterns using a method of constant comparison without preconceived theories (Glaser and Strauss, 1967). The four stages of the 'analytical cycle' were used to structure the analytical approach: develop codes; describe and compare; categorise and conceptualise; and develop theory (Hennink et al, 2011). The analysis employed traditional analysis (Titscher, Meyer, Wodak, and Vetter, 2000) to transform the "raw data into a standardised form" through a process of coding and identifying results that deviated from the norm (Babbie, 2001, p309). The focus was themes and categories (variable-orientated) as opposed to the organisations and participants (case-orientated) (Boeije, 2010). The reason for this was to generate a depth of understanding, about the challenges and opportunities of integrating carbon measurement and mitigation within destination management processes.

Developing the codes is an important technique for segmenting, translating and differentiating raw data (Miles and Huberman, 1994). Three stages of coding were identified: open coding where the initial features and variables of the data were identified and their properties described; axial coding, which identifies causal relationships and explicit connections between open codes; and selective coding, which selectively codes the data against an identified core variable, validating relationships and refining interpretation (Boeije, 2010). These three stages required interaction with the data, in particular describing it, asking questions and making comparisons. Concepts were systematically developed and verified in terms of their properties and dimensions, major themes and categories were described, and similarities and differences were identified, for example, considering the different dimensions of governance. Additional information was also logged on context, relationships, contradictions and notes to help determine explanations. Caution was taken not to jump to conclusions and to be aware of one's own interpretations, assumptions and prior experience (Corbin and Strauss, 2014). Considerations included the research context and process, cases that did not fit emerging patterns (negative cases), expressed emotions, and being conscious of bias, personal experience and assumptions (Corbin and Strauss, 2014).

NVivo was used in this research to enhance efficiency and flexibility of data management and to facilitate and validate coding and the analytical process. NVivo was also used to help avoid analytical distraction and deterministic processing (Bazeley and Jackson, 2013). This was helpful, as the research produced a large amount of data and analysis was primarily cross-case and variable-orientated, rather than within-case, which would be easier to manage using traditional methods. NVivo also assisted with filing, editing, data storage and retrieval, code application, data examination, auditability, memo writing and visualisation (Bazeley and Jackson, 2013).

Initially, an inductive and emergent approach was taken for the thematic coding to identify prominent themes and patterns. These were further compared and contrasted from a deductive position in order to align the data to the research questions. For each question, a separate NVivo project was created to identify themes and responses and these were broken down into components and coded to individual nodes where practicable (to reduce duplication), unless the comment clearly tracked to more than one category. To increase the robustness of interpretation, the results were compared and combined and reviewed in different ways. For example, diagrammatic representation, matrices and drawing helped interpret and understand the data and in this research mind mapping and NVivo software were used to develop cluster and tree maps to identify popular nodes and relationships between concepts. Finally, these analytical findings were collated to provide a framework through linking and refining categories, and checking for gaps in logic (Boeije, 2010). Alongside the analysis, theoretical and methodological memos were made to record the researcher’s thinking, actions and decisions.

3.5.4.5 Ethics and Accessibility

Ethical approval was received prior to the research through the Plymouth University Faculty of Science and Technology Human Ethics Committee. All participants who registered interest in attending were emailed a research information sheet and self-consent form to complete and return prior to the workshop or interview, to ensure informed consent. The consent form provided written confirmation that their employer or organisation was happy for them to take part in the research. It clarified that participants’ views would not be attributed (anonymity would be protected) and that they were speaking from their personal perspective and not on behalf of their organisation. The consent form also made participants aware of the ethics and confidentiality agreement and their right to withdraw. This was reiterated at the beginning of the workshops and interviews. The information sheet and consent forms used for the workshops and interviews are shown in Appendix 9.

Confidentiality and anonymity were maintained throughout. The researcher ensured that the primary results, including recordings, were not attributable to an individual. All data were transcribed anonymously and a code of numbers and colours used to identify workshop and interview recordings and transcripts, allowing confidentiality during transcription. Participants were made aware of this in the information sheet and consent form documentation. This helped with the spirit of openness and to ease any power imbalance that may have been perceived between individuals in the workshops and with the researcher in the interviews. The data were stored securely using encrypted files and/or in password protected files with passwords known only to the researcher and transcribers.

The choice of venue and planning of all the exercises considered accessibility and all participants had the opportunity to identify any dietary or access requirements. A thank you email was sent out to all participants as a matter of courtesy to maintain dialogue and to keep them informed. It also confirmed the next steps and offered the opportunity to be sent the final results of the research in an attempt to foster and further the sense of collaboration.

3.5.4.6 Validity and Reliability

Evaluating validity and reliability requires a critical examination of the research process and findings, to check that conclusions reflect participants' views (Berg, 2001). Quantitative conceptualisations of validity and reliability are inappropriate for qualitative research (Creswell, 2013; Popay, Rogers and Williams, 1998). Creswell (2013) suggests, however, that internal validity is a strength of qualitative research and that the researcher should set out the steps taken to check the quality and trustworthiness of the research findings. This can be done using measures of quality such as credibility, transferability, dependability and conformability (Guba and Lincoln, 1989).

In terms of credibility, it is the researcher's responsibility to describe experiences, beliefs, training and thinking which may have influenced and affected the research (Finlay, 2002). Researcher positionality was covered in section 3.1.2 and continues to be a theme in the remaining chapters. The previous chapter also described the research context, structures and settings in which the research took place and acknowledges potential implications. In addition, the background, justification and detail for the theoretical, methodological and analytical approaches employed in this research are provided. The mixed-method approach and use of multiple sources of data and evidence (data and methodological triangulation) to verify and test findings alongside participant verification, enhances credibility (Wise, 2011; Berg, 2001). In addition, if the methods employed achieve a range of diverse perspectives it has been shown to improve the validity and applicability of the research (Boeije, 2010; Creswell, 2013).

The transferability of the qualitative research component of this study is hard to determine as the social world is always changing and the research comprised a mixed-method approach, making exact-replication impossible. Participants also mediate social reality, so replicating time and context specific research is problematic (Kvale, 1996). Lincoln and Guba (1985) suggest that it is the responsibility of the reader to determine the transferability of the research and whether it can be suitably applied to another setting. To facilitate this, the methods and analysis employed are identified in sufficient detail that another researcher could attempt to replicate or make comparisons if appropriate.

Dependability is about capturing the changes that occur in research design, delivery and analysis (Wise, 2011). These were captured through the researcher's notes, memos and log book and are included in the results and discussion chapters. This provides a degree of transparency with regard to the dependability of the research. Confirmation comes from the extent to which interpretations are grounded in, and consistent with, the data and if someone from outside the research could confirm the findings (Wise, 2011). This, in part, was dealt with through the research design and the use of stakeholder workshops to examine and critique the data. Methodological triangulation was also used to help control any bias and to identify any inconsistencies in the interpretation. The researcher's assumptions and values have been identified in the methodology, and where practicable, the researcher engaged peers (supervisors and colleagues) to reflect on, and critically review, the data collection process and analysis (Marshall and Rossman, 2011; Wise, 2011).

3.6 Chapter Summary

This chapter reviewed a range of methods and described the quantitative (REAP Tourism carbon baseline and scenario modelling) and qualitative methodologies (participatory workshops, evaluation questionnaire and semi-structured interviews) employed. The chosen methods complement each other and provided a robust mechanism to review the carbon footprint of tourists in destinations, to review the perceptions and opinions of stakeholders and to investigate the opportunities and challenges for low-carbon destination management. Issues relating to design and delivery were discussed and the specific detail described. The results are presented in the next two chapters, the quantitative data in Chapter 4 and the qualitative findings in Chapter 5.

4 Quantitative Results

4.1 Introduction

The aim of this chapter is to present and analyse the results of the REAP Tourism carbon (CO_2e) baseline and scenario modelling, which informed the qualitative research. The carbon footprints are compared for different visitor types (day, domestic staying and overseas staying) and different destinations across the South West to investigate carbon impact. The carbon footprint of different trips and events are explored, alongside estimates of eco-efficiency and the potential cost of carbon for tourism. The results of alternative scenarios are also examined, looking at different carbon mitigation and growth strategies, and building on the assessment of global tourism emissions undertaken by the UNWTO (UNWTO, UNEP and WMO, 2008). This provides critical data for addressing the first two research questions.

4.2 Baseline Modelling

4.2.1 Visitor Footprints

The first objective was to examine the baseline carbon footprints of visitors to the South West (SW). Table 4.1 provides the total and per visitor day (PVD) CO_2e results, alongside key data on visitor trips, nights and expenditure for 2006. The total CO_2e footprint for the South West visitor economy was estimated to be 12.3 million tonnes. This contributes an additional 14% to the South West resident impact, estimated at just over 85 million tonnes. This is equivalent to the annual carbon footprint of the resident population in the county of Cornwall (REAP Model, 2006).

Table 4.1: South West visitor total and per visitor day CO_2e footprint

2006 CO_2e Baseline	Total CO_2e (tonnes)	CO_2e PVD (kg)	Total Visitor Trips[42]	Total Visitor Nights	Total Visitor Expenditure
Overseas staying visitor	3,928,324	196.4	2,230,000	20,000,000	£824,000,000
Domestic staying visitor	3,846,599	49.2	20,310,000	78,260,000	£3,681,590,000
Day visitor	4,511,130	47.8	94,462,365	N/A	£3,989,673,925
All visitors	12,286,053	63.8	117,002,365	98,260,000	£8,495,263,925
South West residents[43]	85,144,585	45.5			

Source: Developed from Whittlesea and Owen, 2012, Table 2, p.853
Permission to reproduce this Table has been granted by Taylor and Francis.

4.2.1.1 Variation by Visitor Type

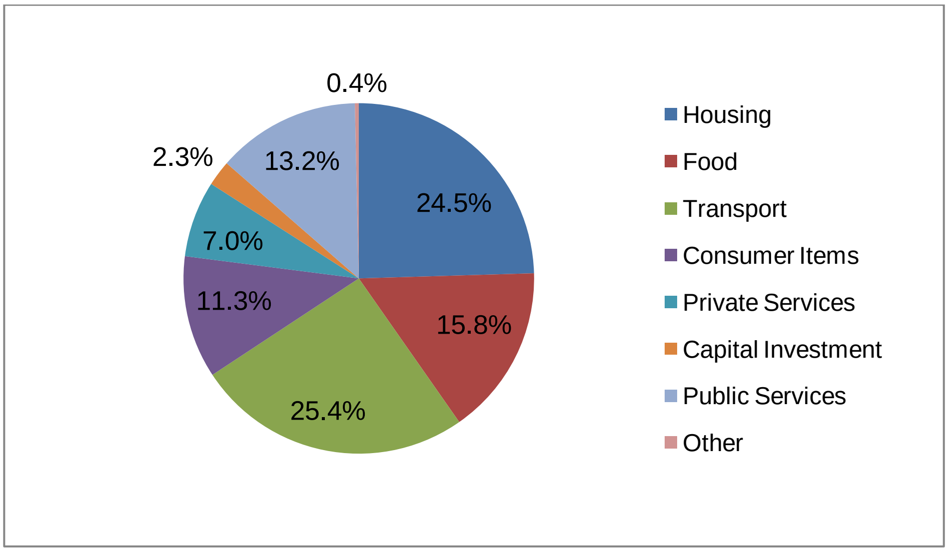
The average impact of a South West (SW) visitor is 63.8 kg CO_2e per day but results show that this figure varies by visitor type. For example, the average overseas staying visitor has a daily impact of 196.4 kg CO_2e, almost four times the impact of a domestic staying visitor (49.2 kg CO_2e). The overseas visitor presents a particular carbon mitigation challenge as they comprise only 2% of total trips (20% of nights), 10% of total expenditure and contribute 32% of total CO_2e impact. The impact of day visitors and domestic staying visitors are closer to the average resident in the South West, who has a footprint of 45.5kg CO_2e per day. Day visitors comprise the most trips and contribute the highest expenditure in 2006, equating in part to the highest aggregate CO_2e impact. However, when the detail is examined, the day visitor has the lowest PVD CO_2e impact of 47.8kg, equivalent to only 24% of the overseas PVD footprint of 196.4kg.

The average PVD footprint for SW residents has been included for context[44] and is estimated to be 45.52kg (REAP Model, 2006), only 2kg less than an average SW day visitor.

[42] Trip, Nights and Expenditure data sourced from the South West Value of Tourism Report, 2006
[43] *South West Resident footprint data was sourced from the REAP Model, SEI, 2006*

Figure 4.1 shows the breakdown of the carbon profile of the SW resident footprint, and shows that half the footprint comes from transport (25%) and housing (25%), followed by food (16%). This is important as the day visitor is likely to incur further 'residential' impact from additional food and operating their home. Both domestic and overseas staying tourists may also have some ongoing residential impact whilst they are on holiday but at present no data exist to determine this additional impact.

Figure 4.1: Construction of the SW Resident CO_2e Footprint



Source: Author using data from the REAP Model, SEI, 2006

Although the categorisation is different for the resident and visitor footprints (related to their consumption), it is useful to consider the visitor CO_2e footprint in the context of the resident (lifestyle) footprint. This provides insight into the differences in size and constitution, and could lead to destination management actions that mitigate the impact of residents and visitors alike. It could also be useful to inform consumer action. For example, individuals could budget and save CO_2e credits in their daily life, to offset increases and indulgence incurred on holiday (similar to current financial budgeting). Studies have shown however, that efficiencies in one area will

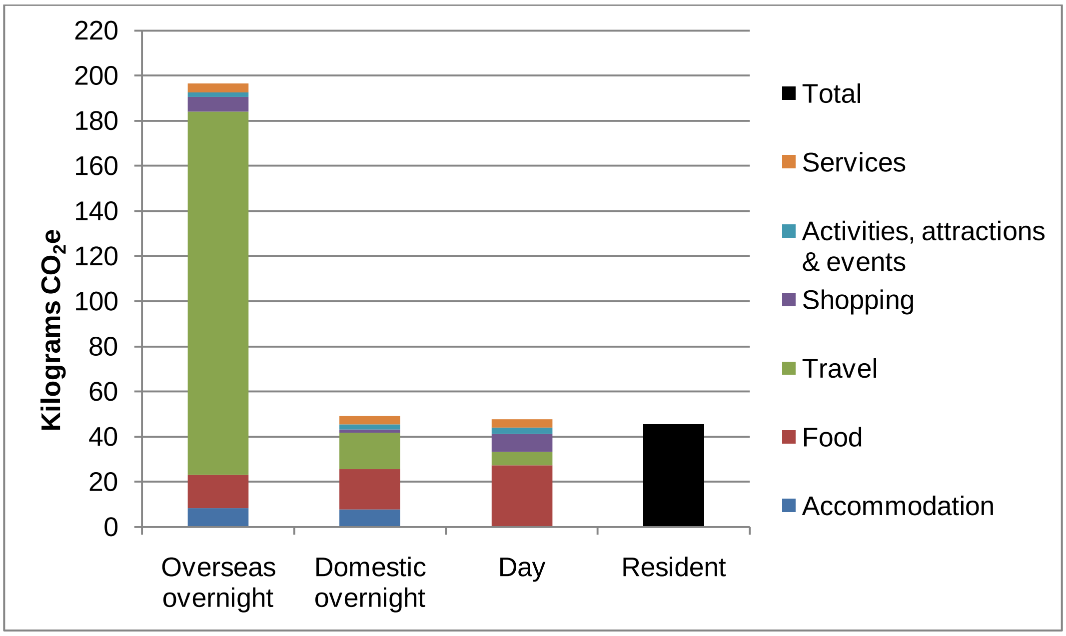
[44] Uses the original REAP methodology and conversion factors for consistency and comparability

not necessarily lead to a net reduction in energy consumed (known as the *rebound effect*), and can have significant unintended consequences that erode or exceed energy or emissions savings e.g. using savings on a fuel efficient car for a higher impact transatlantic holiday (Herring and Sorrell, 2008). This is a critical consideration for any climate mitigation policy, including tourism, and suggests that some form of annual gross CO_2e budget and associated monitoring is required, to work towards an overall net reduction. It would also require more detail for consumers and managers on the carbon impact of products and services.

4.2.1.2 Variation by Theme

Figure 4.2 presents the relative PVD footprint results (kg CO_2e) broken down by six themes (combining activities, attractions and events) to examine why impacts vary and the footprint composition for each visitor type. There is a 75% difference in carbon emission impact between the domestic and overseas staying visitor and only 2.8% between the domestic and day visitors. The results show that the most significant impact for overseas visitors is travel (82%), followed by food (8%) and accommodation (4%). For the domestic staying visitor, travel is comparatively low (33%), with the largest proportion of the footprint coming from food (36%). Proportionately, the domestic visitor has four times the impact for accommodation (16%). For the day visitor, the proportional profile is quite different, with food causing the most impact (57%), followed by shopping (17%) and travel (12%). These impacts are informed by the type and amount of products visitors consume and represent the consumption patterns of the different tourist types, suggesting that different visitors require different strategies for carbon reduction. Although some overarching carbon mitigation policies may help to reduce the CO_2e impact of all visitors, those associated with behaviour and choice may need tailoring and configuration for each individual type.

Figure 4.2: Construction of the South West per visitor day CO_2e footprint by theme



Source: Author, updated from Whittlesea and Owen (2012), Figure 3, p855
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If day visitors are removed and only staying visitors are examined, then overseas comprise 10% of all staying trips (20% total nights) but still contribute 51% of the CO_2e impact. This is particularly problematic because the overseas visitor markets are a key focus for UK tourism destinations and the resulting PR and marketing effort.

These results show that travel is a significant contributing factor for the visitor CO_2e footprint, and is confirmed by global estimates (UNWTO, UNEP and WMO, 2008) and other studies exploring the impact of tourist travel (Patterson et al, 2007; Peeters and Schouten, 2006; Konan and Chan, 2010). The total CO_2e footprint of SW visitor travel is approximately 5 million tonnes, of which 64% is from overseas staying visitors, 25% from domestic staying visitors, and 11% from day visitors as represented in Figure 4.3.

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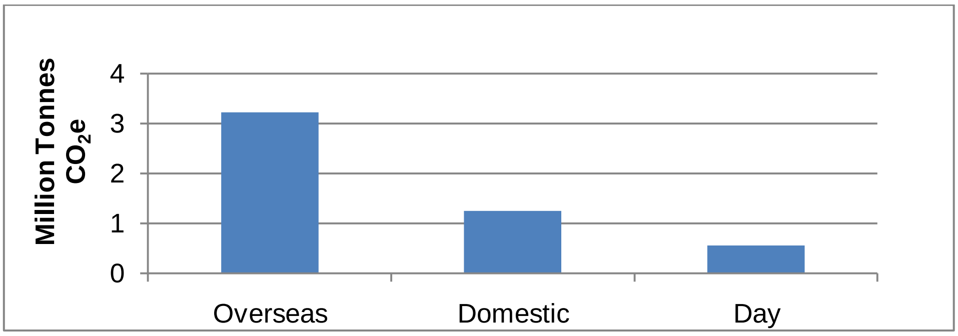
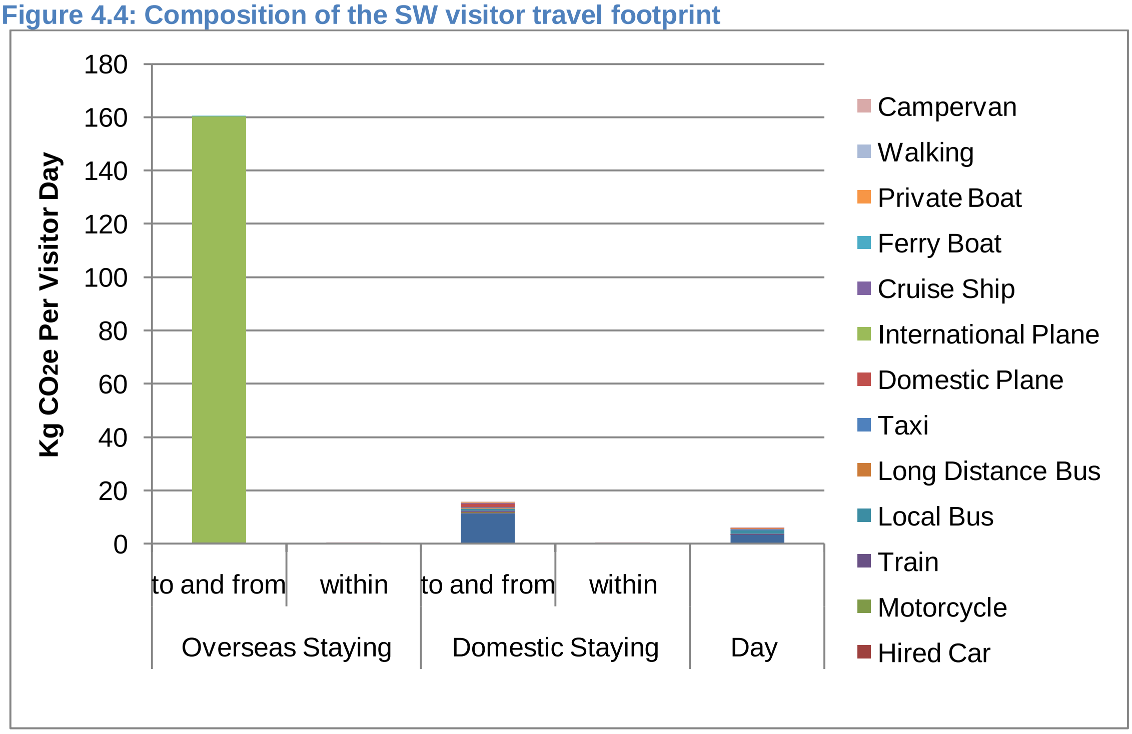
Figure 4.3: Total travel CO_2e footprint for 2006 by visitor type



Source: Author

Figure 4.4 explores the composition of the travel component of visitor footprints (PVD), breaking down the results by travel mode and travel 'to/from' and 'within' the destination. Unsurprisingly, aviation to/from the destination is the main contributor to the travel footprint of overseas visitors, contributing 99.4% of the emissions and providing a key focus for policy in this area. However, in comparison, aviation does not really contribute much to the transport footprint of domestic staying and day visitor travel, where the car is the primary mode of travel and cause of impact. Travel to/from is the predominant cause of emissions for all visitor types.

Figure 4.4: Composition of the SW visitor travel footprint

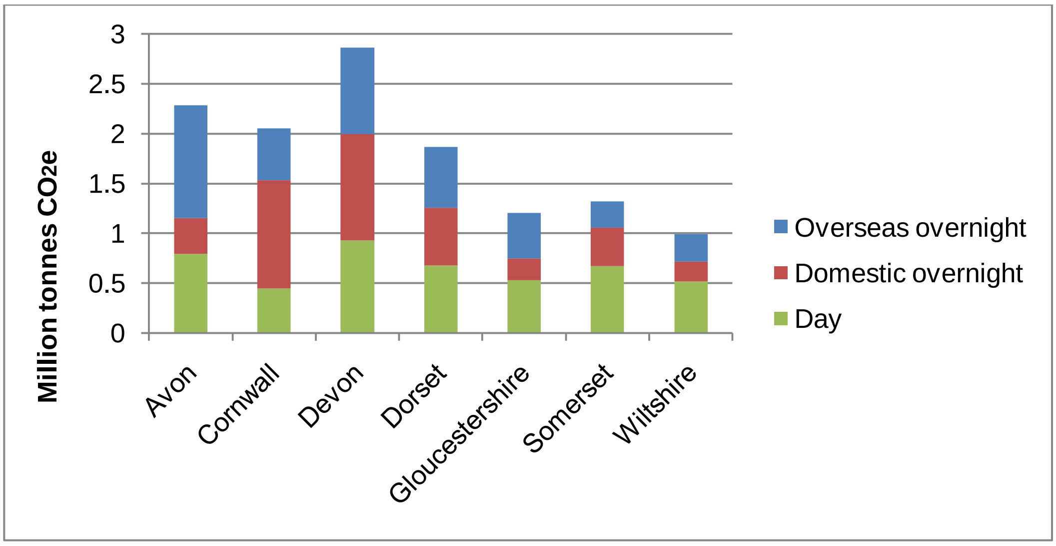


Source: Author

4.2.2 Destination Results

Another way to investigate the CO_2e footprint of the visitor economy that is limited in present studies is to model variation by location. This is informed by sub-regional data, which includes visitor volume, accommodation choice, average distance travelled by mode, the average number of visits to attractions and the total average expenditure of visitors. The results illustrate differences in terms of the size and constitution of the visitor CO_2e footprints. Figure 4.5 compares the total CO_2e footprint of overseas, domestic and day visitors for the seven sub-regional destination areas in the South West. The largest impact is attributable to Devon, followed by Avon and Cornwall. These results are directly linked to visitor numbers and composition in terms of types, reflecting the most popular tourist destinations and those attracting larger numbers of international visitors. This illustrates a potential need for destination-level footprinting to inform local strategies and action plans. For example, 53% of Cornwall's visitor CO_2e impact is from domestic staying visitors with only 25% from overseas, whereas in Avon, half of the impact (50%) is from overseas visitors with only 16% coming from domestic staying visitors.

Figure 4.5: 2006 total South West visitor CO_2e footprint by sub-region



Source: Author, updated from Whittlesea and Owen (2012), Appendix 5
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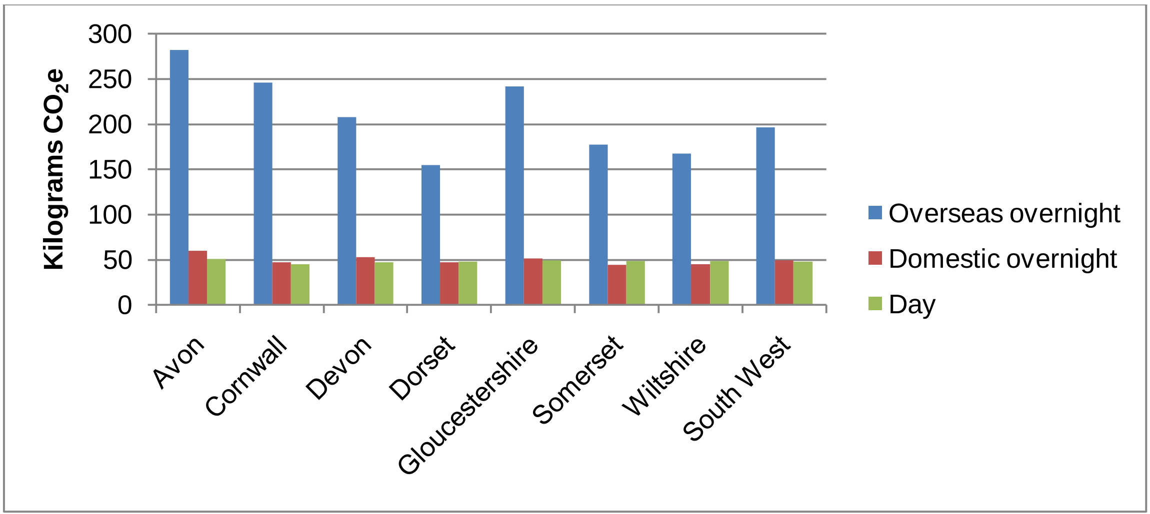
Using REAP Tourism, the detailed composition of each of the three visitor types can be explored for the seven sub-regions. Figure 4.6 presents the sub-regional per visitor day results against the South West regional average to demonstrate the variation which exists. These results show that despite Devon having the biggest total CO_2e footprint, the average PVD visitor footprint is almost the same as the SW average. It also shows considerable variation in the impact of overseas visitors (between 150-275kg), reflecting expenditure and consumption patterns that equate to a high CO_2e impact, defined by choice of accommodation, activities, shopping, eating behaviour and travel choices.

Although differences can be observed between the domestic staying and day visitor impacts between the seven areas, the range is marginal (between 45-55kg) in comparison to overseas visitors. Somerset and Wiltshire are the only two sub-regional destinations where the average day visitor impact exceeds the domestic overnight impact. Despite Dorset being the fourth highest in total impact (Figure 4.5), it attracts international visitors with the lowest average PVD CO_2e impact, 45% lower than Avon (which incorporates the city of Bath) with the highest.

Figure 4.6: 2006 daily sub-regional visitor CO_2e footprint for the South West



Source: Author, updated from Whittlesea and Owen (2012), Figure 2, p854
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4.2.2.1 Variation by Destination

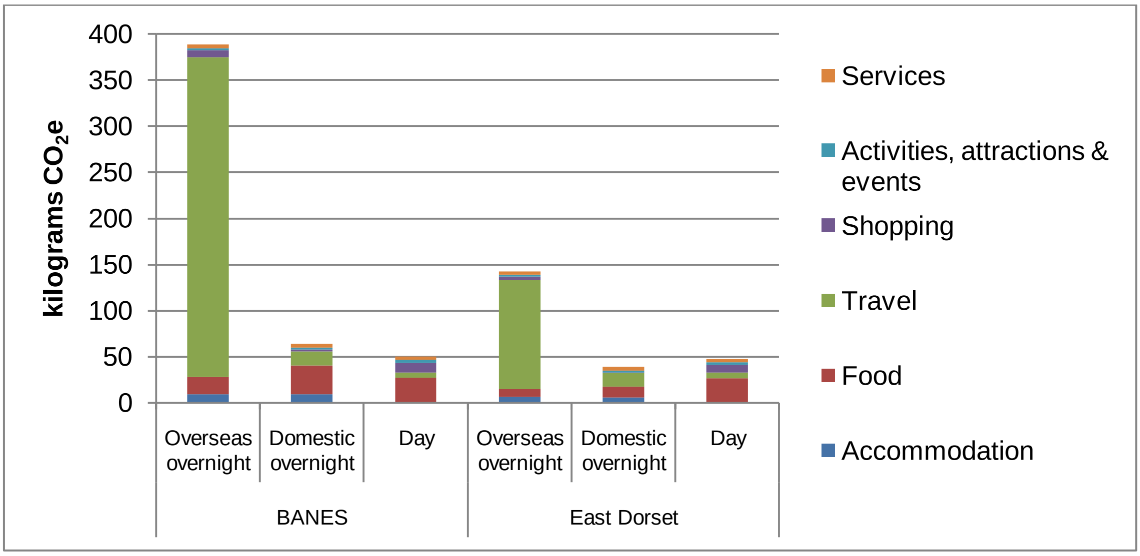
Examining the relative 'per day' values helps further to understand the construction of the footprint and the variation in visitor impact for different areas. To explore this further, the thematic profile of two local authority areas is examined for the unitary authority of Bath and North East Somerset (BANES) which has the highest average visitor CO_2e footprint in the South West, and the district of East Dorset which has one of the lowest.

Investigating the relative results by type of visitors and themes of impact (see

Figure 4.7) helps to illustrate that the travel impact of BANES' overseas visitors is the main cause of the difference in impact size. Examining the sub components of each theme and breaking down the detail by travel mode can help further with mitigation and future planning. For example, the detail shows that the reason for the high travel footprint is that 88% of the kilometres travelled 'to and from' the destination by all BANES visitors is by international plane.

The impact per passenger kilometre of different travel modes (see Table 3.6) reveals that international planes do not have the highest conversion factor, so high impacts associated with overseas visitors are not necessarily a function of the mode of travel, but rather the volume of kilometres travelled. This type of analysis could inform destination marketing strategy towards the domestic and short haul European markets, rather than long haul markets, to help reduce absolute transport impact. Further strategies to reduce per visitor day transport impact could be to increase length of stay. This is investigated further in section 4.6.2. These results suggest that destination level CO_2e accounting could be useful to inform carbon management and planning as significant differences clearly exist.

Figure 4.7: Per day CO_2e footprint for two South West districts



Source: Author, updated from Whittlesea and Owen (2012), Appendix 6
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Table 4.2 shows the total CO_2e contribution by visitor type alongside total visitor days and total travel impact for BANES. It reveals that overseas visitors account for 20% of visitor days but contribute 64% of the total CO_2e emissions. If the travel component of BANES footprint is examined in isolation, overseas visitors account for 91% of the total travel impact. Day visitors in contrast account for more than 2.5 times the number of visitor days but have about a third of the CO_2e impact and contribute less than 4% of the total travel impact.

Table 4.2: Contribution to BANE's impact by visitor type

	Overseas staying	**Domestic staying**	**Day**
% of BANES' total visitor days	20.1%	26.8%	53.1%
% of BANES' total impact of CO_2e	64.2%	14.0%	21.8%
% of BANES' total travel impact	91.0%	5.3%	3.6%

Source: Author, updated from Whittlesea and Owen (2012), Table 3, p855
Permission to reproduce this Table has been granted by Taylor and Francis.

4.3 Eco-efficiency (more value with less impact)

A strategic and political measure of success for local and national tourism is growth in visitor expenditure (or numbers equated with increased expenditure). Within this is an embedded interest in attracting overseas visitors who are believed to bring in ‘new’ and more money, and a better return on investment. The economic benefit and carbon cost of visitors becomes, therefore, an important area to examine.

Table 4.3 explores visitor expenditure, the cost in terms of carbon and eco-efficiency measures combining these two parameters (environmental performance divided by financial performance). In terms of benefits, the mean 2006 expenditure (£) is highest for domestic staying visitors at £47.04 per person per night, followed by day visitors to the South West of £42.24 per person. Contrary to expectations, the lowest expenditure is for overseas staying visitors at £41.20.

Figure 4.8 illustrates the relative expenditure in GBP (£) of the different visitor types and investigates the carbon impact in terms of notional economic cost. This has been calculated using the carbon floor price[45] (CFP) which was launched at £16 per tonne of CO_2 in April 2013 (HMRC, 2014). This should be an important economic consideration for a sector with high energy consumption, where current plans by the Treasury are to increase the carbon floor price to £30 per tonne by the end of the decade and £70 per tonne by 2030 (Ares, 2013).

[45] The carbon floor price is a regulatory/taxation policy where polluters pay a minimum amount of money for the right to pollute (regardless of the price of permits for the EU Emissions Trading Scheme).

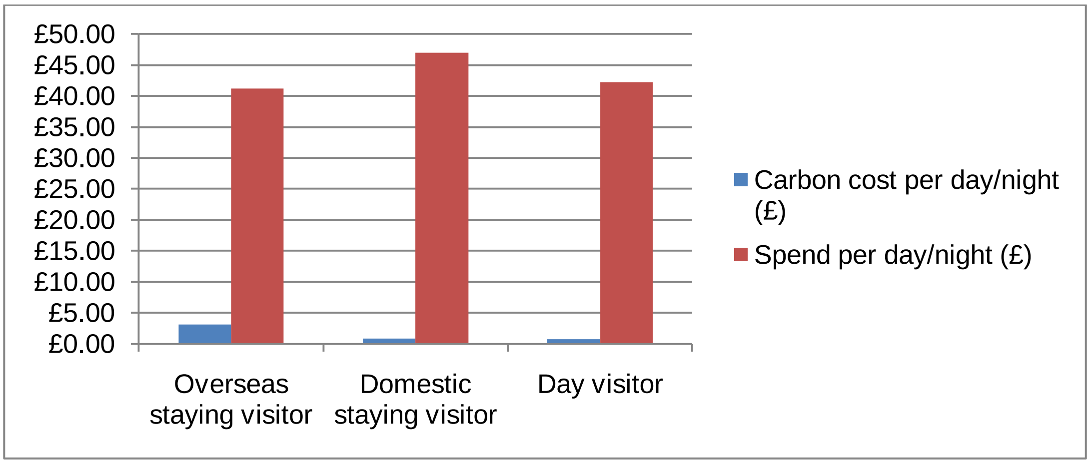
Table 4.3: Value of tourism: exploring economic benefits and costs per visitor type

South West Visitor Economy	Total CO_2e (tonnes)	Per day /night (kg)	Carbon Cost (£16 / tonne)	Visitor Expenditure[46]	Kg CO_2e per £ spent	Nights	Trips	Carbon cost per day/night	Spend per day /night	Carbon cost per trip (£)	Spend per trip (£)
Overseas staying visitor	3,928,324	196.42	£62,853,184	£824,000,000	**4.76**	20,000,000	2,230,000	£3.14	£41.20	£28.19	£369.51
Domestic staying visitor	3,846,599	49.15	£61,545,584	£3,681,590,000	**1.05**	78,260,000	20,310,000	£0.79	£47.04	£3.03	£181.27
Day visitor	4,511,130	47.76	£72,178,080	£3,989,673,925	**1.13**	N/A	94,462,365	N/A	N/A	£0.76	£42.24
South West Visitors	12,286,053	63.75	£196,576,848	£8,495,263,925	**1.45**	98,260,000	117,002,365	N/A	N/A	£1.68	£72.61

Source: Author

[46] Source: South West Tourism (2008): Value of Tourism 2006 Report

Figure 4.8: Economic and Carbon Costs in GBP per day of different visitor types



Source: Author

The results in Figure 4.8 are interesting in both economic and carbon terms based on relative (PVD) cost. Overseas visitors score the worst with the lowest expenditure (£41.20) and highest proportional CO_2e cost of 8% (£3.14). The preferred combination for a successful low-carbon tourism economy is a high expenditure with a low CO_2e impact. This would suggest a domestic staying visitor market should be prioritised, followed by day visitors, both of whom have a 2% CO_2e cost. These results of course depend on the allocated external carbon price and could be considerably higher. If projections or comparisons were made over time, they would also need to consider an annual inflation factor.

External prices vary and some businesses use a separate internal price of carbon, but what is certain is that the cost of carbon is uncertain and could significantly escalate or reduce and experience spikes (Clark, 2013). The carbon cost could also represent an actual cost of CO_2e to the organisation from buying offsets or participating in schemes such as the Carbon Reduction Commitment (CRC) Energy Efficiency Scheme[47].

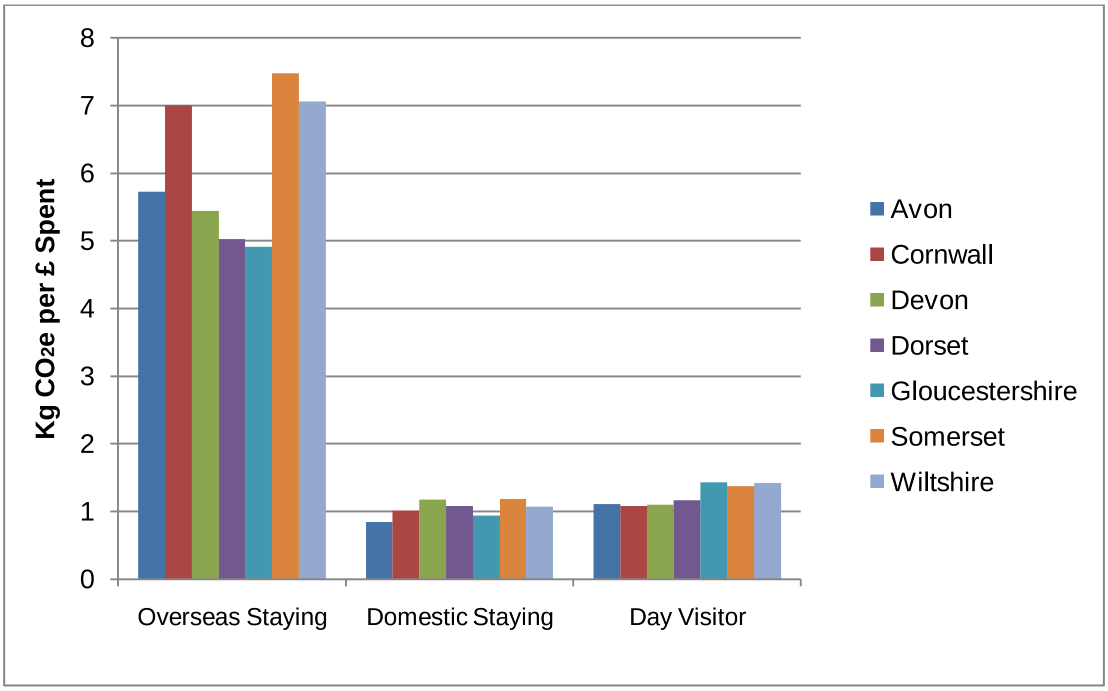
[47] CRC Energy Efficiency Scheme is a mandatory carbon emissions reduction scheme in the UK that applies to large non-energy-intensive organisations in the public and private sectors

Returning to financial implications, overseas visitors tend to stay for a longer period of time, with an average trip length of 9 nights in comparison to domestic visitors of 4 nights. As Table 4.3 shows, this is where overseas visitors perform better in terms of expenditure (£), with an average overseas staying trip value of £370 compared with £181 for a domestic staying trip. However, overseas visitors fare worse financially in terms of carbon costs (£28 compared with £3 respectively). It could be argued that there is a disproportionate focus in marketing attention on overseas visitors and that if this was redirected to the domestic market, it could encourage increases in the length of stay of domestic visitors to levels which are comparable with current overseas trip length.

Another way of interpreting the economic and carbon value of visitors is to consider eco-efficiency ratio indicators, often formulated as 'GDP per environmental influence' (World Business Council for Sustainable Development, 2000, p26). Eco-efficiency can also be examined as the ratio between value (e.g. £ spent or per million £ GVA) and the impact (CO_2e) of a product.

Figure 4.9 compares the eco-efficiency (*CO_2e emitted per £ spent*) of visitor types for each sub-regional destination. With the exception of Devon, where the day visitor eco-efficiency score is 1.10kg/£, the most efficient visitor type is consistently the domestic staying visitor, with scores ranging from 0.85kg/£ (Avon) to 1.17kg/£ (Devon). Average day visitor scores are relatively close to domestic staying visitors, with the lowest being 1.07kg/£ (Cornwall) and does not exceed 1.43kg/£ (Gloucestershire). The eco-efficiency of overseas staying visitors varies between destinations, and ranges from 4.92kg/£ (Gloucestershire) to 7.48kg/£ (Somerset) and depending on the destination, are 4-7 times the intensity of the domestic staying visitor.

Figure 4.9: Eco-efficiency of South West destinations by visitor type



Source: Author

These results help to broaden the interpretation of the financial implications of different visitor types through consideration of the financial data alongside the associated release of CO_2e emissions. This can provide strategic cost information about visitors, products, activities and segments of the tourism industry. The increasing costs associated with carbon could also present opportunities for tourism if the new investment goes into low-carbon technologies, green growth and drives down long-term electricity prices.

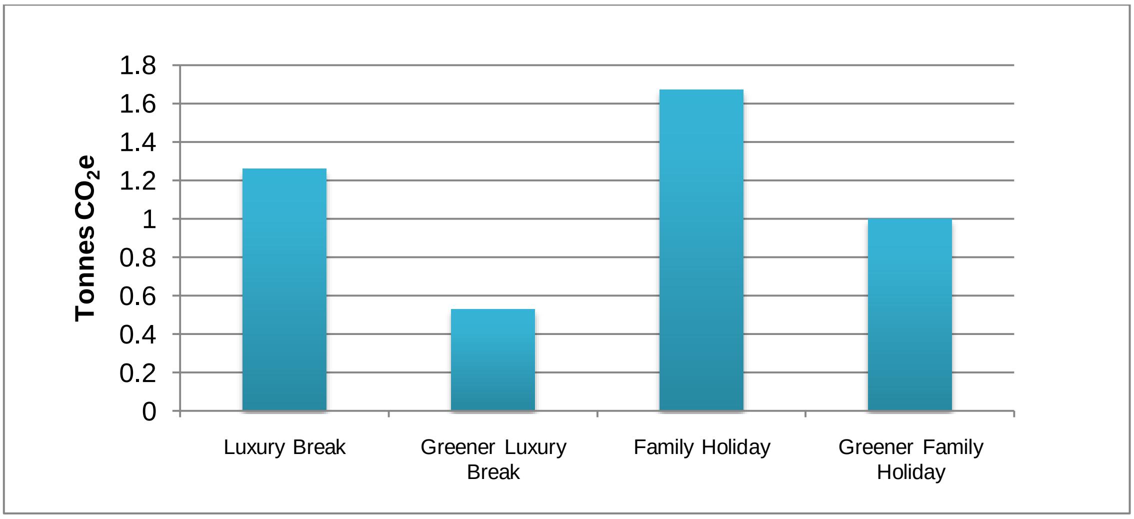
4.4 Visitor and Trip Profiling

So far, visitors have been crudely examined by type in terms of day, domestic and overseas, but further profiling can deepen the understanding of different visitor typologies and the varying impact of trip and consumer choices on CO_2e footprints. This can be useful because behavioural change in visitor consumption, taste and choice of products is a key component of carbon mitigation strategies. In addition, consumers can also be an agent of change. Improved product and trip information could help visitors make informed lower-impact decisions, and may become a visitor expectation or demand (Miller, 2003).

To examine consumer choices further, a 'family holiday' and a 'luxury weekend break' were compared, to investigate the relative impacts of these two high-expenditure trips. The REAP Tourism model was also used to investigate whether the original high impact trips (*associated with high-expenditure*) could be reduced if different choices and decisions were made. Table 4.4 details the expenditure and consumption assumptions made to model these four different trip and visitor profiles, considering length of stay and accommodation, travel, expenditure and activity choices.

Figure 4.10 presents the modelled results for the total impact of each trip, showing the original trip results against an alternative 'greener' option where lower carbon choices or decisions have been made. The results of the 'lower' carbon options are of particular interest because 'total' trip impact in terms of the greenhouse gas footprint is significantly reduced for both trips (58% and 40%), yet in both circumstances trip length and expenditure were increased.

Figure 4.10: Total greenhouse gas footprint for different trips



Source: Whittlesea, Hurth and Agarwal, 2015, Figure 20.1, p. 312
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Table 4.4: Information used to model four different trip profiles in REAP Tourism

Trip Comparison	Luxury Break	'Greener' Luxury Break	Family Holiday	'Greener' Family Holiday
Destination and length of stay	Bath for 3 days	Bath for 4 days	Torquay for 8 days	Torquay for 8 days, breaking the trip up with an additional 2 days at Exeter
Accommodation	2 nights in a luxury 5* hotel	3 nights in a luxury 5* GTBS accredited hotel	7 nights in a 3* all inclusive resort	7 nights in a 3* all inclusive resort in Torquay, 2 nights at a B&B in Exeter
Food	Eats out in high-end restaurants and cafes (assume £10 on café food and £60 on restaurant food)	Eats out in restaurants and cafes that source 'local' food	Eats out in 'chain' restaurants and pubs (assume £10 on pub food and £60 on restaurant food in total)	Eats out in a GTBS 'chain' restaurant and a pub that sources 'local' food
Travel	Flies to Bristol from Edinburgh and uses bus and train to get to Bath and taxis to travel around Bath (assume total domestic plane distance of 1000km, local train distance of 20km and taxi distance of 5km)	First class train from Edinburgh to Bath and 'pedal carriage' to travel around Bath (assume total train distance of 1020km and 'pedal carriage' distance of 5km)	Uses own car to travel to Torquay from Birmingham and travels on three 20km day excursions (assume total car distance of 820km)	Train travel from Birmingham to Torquay via Exeter and hire a car to travel on three 20km day excursions (assume total train distance of 760km and hire car distance of 60km)
Shopping	Buys new jewellery and imported art (assume total spend of £300 on jewellery and £200 on art)	Buys antique jewellery and local art (assume total spend of £300 on jewellery and £200 on art)	Buys a surf board, some beach toys and goes shopping (assume total spend of £200 on large recreational items, £20 on toys and £100 on clothes)	Hires a surf board, buys locally produced toys and goes shopping in GTBS accredited shops (assume total spend of £40 on local toys and £100 on clothes)
Activities	Two sessions at the Spa	One session at a GTBS accredited spa and one walking trip along the canal	Days out to the beach	Days out to the beach
Attractions	Visits the Roman Baths and an art gallery	Visits the Roman Baths and a local art gallery	Visits a Zoo, the Donkey Sanctuary and a Theme Park	Visits a Zoo, and animal sanctuary and a historic property
Events	Goes to a comedy club	Goes to the night-time comedy walking tour around the city	Goes to the fair	Goes to see local live music

Source: Whittlesea, Hurth and Agarwal, 2015, p.310
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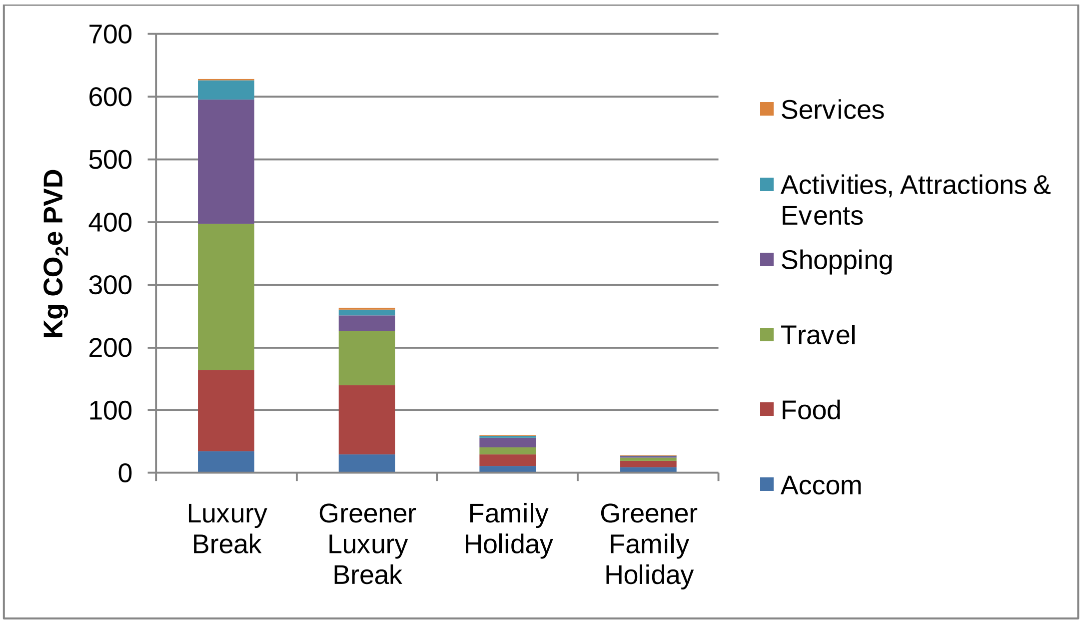
Despite the high daily impact associated with the luxury break, changes in consumption through ‘low-carbon’ choices reduced the daily footprint by 58%, whilst at the same time increasing expenditure and length of stay. For example, the travel component was reduced by 63% from 234kg to 87kg CO_2e PVD by switching from air travel to train. The composition of the impact between the two trips is significantly different (Figure 4.11). The highest proportional impacts of the family holiday footprint were food (31%), followed by shopping (26%) and then travel (19%). The high impact areas of tourist consumption are the mode of travel to the destination and the procurement choices for food and shopping, but accommodation and activities can also influence the greenhouse gas footprint.

Figure 4.11: Per visitor day greenhouse gas footprint for different trips



Source: Whittlesea, Hurth and Agarwal, 2015, Figure 20.2, p. 313
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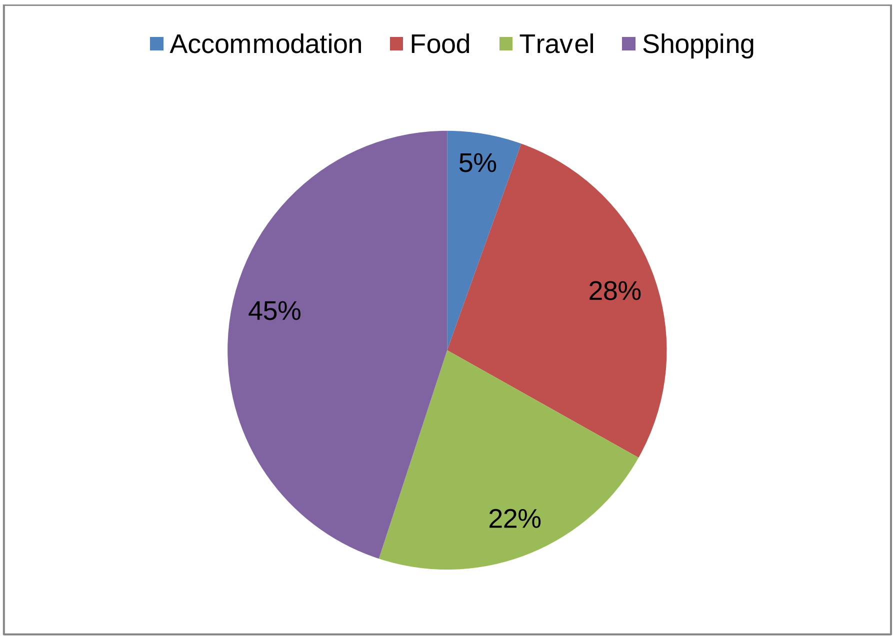
This type of visitor impact modelling demonstrates that it is possible to decouple expenditure from carbon impact, if expenditure is redirected into low or no-carbon products and services (Whittlesea, Hurth and Agarwal, 2015). In terms of destination management, it can help to inform and prioritise the development of lower carbon tourism products, campaigns and target marketing to help drive a low-carbon, yet high-expenditure, visitor economy in destinations. However, although it indicates potential supply and demand-side changes, enacting such change may be more difficult.

4.5 Profiling Events

The REAP Tourism tool has been used to demonstrate the CO_2e impact of different visitor types but can also be used to model the impact of events, which often form a key component of visitor management and destination tourism plans. This is also an area of tourism and visitor management where sustainability codes of practice and standards are becoming commonplace if not a requirement (e.g. BS8901 and ISO20121), and stem from the sustainability commitments of the London 2012 Games and the Global Reporting Initiative (GRI). In addition, there are toolkits, guides and initiatives to support 'greener' event practice and carbon accounting is likely to become a key component.

Modelling was undertaken to measure and explore the impact of a high-profile annual event in Cornwall: the 2011 Boardmasters Music Festival in Newquay. Figure 4.12 presents the modelled CO_2e footprint results using data captured through a visitor survey of 533 attendees to the festival (Whittlesea, 2015). The total greenhouse gas footprint of the visitors and staff was estimated to be 1,680 tCO_2e, and per visitor day is 33.16 kg CO_2e. The predominant contributors of emissions from the event were shopping (45%), followed by food (28%) and then travel (22%). The emissions impact of the event operations was also calculated and was relatively small in relation to the overall impact of the visitors and staff attending the event, comprising approximately 3.7% (62 tCO_2e). The raw data to calculate the operational impact were captured through the event utility providers and organisers.

Figure 4.12: Boardmasters Festival carbon footprint composition



Source: Author

Calculating the carbon emissions released from tourism activities, such as events, provides the basis and scope to reduce and compensate for the footprint. In this instance, 40 acres of rainforest equivalent in size to the festival venue, was protected by Visit Cornwall (the local DMO) through the charity Cool Earth, to secure 10,400 tonnes of carbon, around six times the music festival's impact. This can be useful for destination management in a low-carbon economy because it promotes an understanding of the carbon impact of events to inform reducing operational and visitor footprints, strategy, management plans and funding arrangements, helping event organisers to address areas of high impact.

The outcomes in this instance were used to promote learning and good practice with other event organisers and were an example of a successful partnership between the DMO VisitCornwall, the event organiser Sports Vision and the Cool Earth environmental charity (Cornwall Development Company, 2011). The results served to protect an area of rainforest, provide a baseline carbon footprint, and generate detailed visitor feedback for future events. In addition, it promoted a visible environmental image with the Cool Earth campaign and the results were also used by Visit Cornwall to develop guidance for events managers in conjunction with Cornwall College. The Boardmasters festival footprint results have been written up as a case study in ‘Sustainable Stoke’, a book to promote sustainability in the surf industry (Borne and Ponting, 2015).

The relatively small footprint findings of the event operations are supported by REAP Tourism modelling undertaken by the author for the 2009 Bournemouth Air Festival in Dorset to inform a local debate. The event was run over four days and included flying displays and 1.3 miles of trading and exhibition space. In 2009, the event attracted approximately 1,344,000 visitors and had an estimated expenditure of £25,468,522 and total visitor emissions of 15,120 tonnes of CO_2. The Air Display impact[48] was estimated at between 194 (low estimate) and 217 (high estimate) tonnes of CO_2, just 1.4% of the total estimated visitor emissions from attendance at the festival (Air Festival Symposium, 2010).

4.6 Scenario Modelling

It would have been useful to compare the baseline data from 2006 with more recent years, to see how changes in technology and visitor behaviour may affect the visitor footprint composition over time. However, the time and resources required to update the REAP Tourism dataset and conversion factors to provide time series comparison were not available. It is recognised, however, that this is a key area for future research. Despite the lack of time series data, the REAP Tourism tool and baseline 2006 data can be used to forecast and back-cast scenarios, to help identify key points of influence on the size and constitution of the CO_2e footprint. This scenario modelling approach does not attempt to predict the future but, instead, explores a range of plausible futures to understand differences between

[48] Does not include trade and exhibition impact and this study was only estimating carbon dioxide emissions (CO_2)

them. From a strategic context, this can provide guidance, where longer time horizons are being considered, and broad decisions are needed on how to proceed in the future.

The scenario function of the REAP Tourism tool was used to model the impact of various mitigation and growth scenarios in South West England using the UK target for reducing greenhouse gas emissions by 34% by 2020[49] as the target framework (Climate Change Act: Crown, 2008). The purpose was to estimate the carbon impact of the visitor economy under different scenarios to provide data which could help inform tourism stakeholders interested in moving their destinations towards a low-carbon tourism economy.

4.6.1 Carbon Reduction and Mitigation

Accounting for the CO_2e impact of SW visitors provides a baseline for monitoring, fundamental for target setting and performance management. However, for policy development and planning, scenario modelling estimating how different actions and decisions may reduce or increase the baseline CO_2e footprint, can help inform analyses of alternative options.

Figure 4.13 illustrates a 34% reduction (*the 2020 UK target*) for the average PVD impact, defined by the purple line. In addition, the red line illustrates a 2050 daily budget of 5.5kg based on the Stern Review recommendation that to avoid unacceptable climate change global annual carbon emissions cannot exceed 20GT CO_2e in 2050, approximately 2 tonnes CO_2e per person per year (Stern, 2006). In order to achieve reductions in visitor emissions, various policy propositions and mitigation strategies could be employed, such as those set by the Government's

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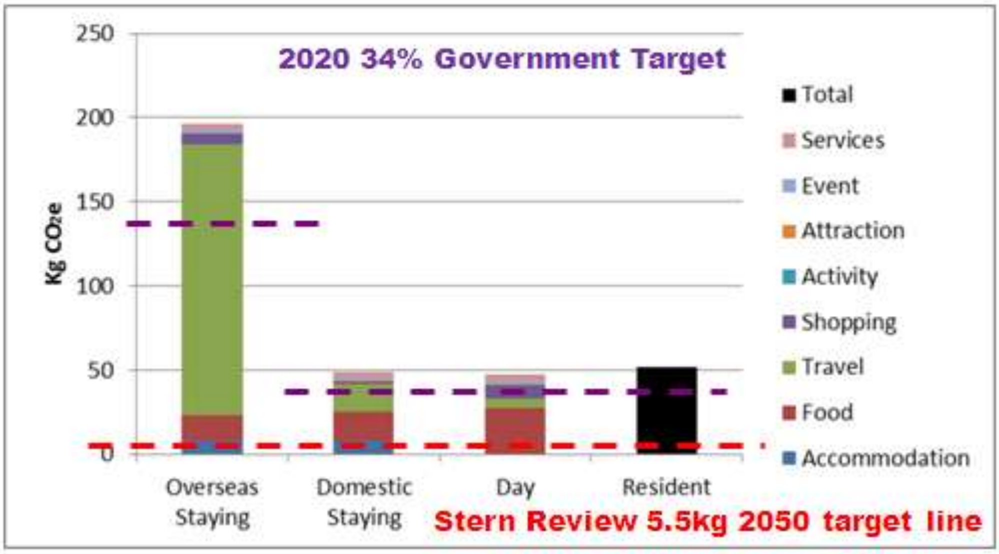
[49] Climate Change Act, 2008. This national target is based on a cut in greenhouse gas emissions on 1990 levels; however, the earliest environmental impact baseline for tourism in South West England is 2006.

Carbon Plan (HM Government, 2011). This research models the impact of some of these and considers whether the UK carbon targets provide plausible and appropriate limits for future tourist activities, examining the individual and combined effects on reducing the 'visitor' CO_2e footprint.

The target lines illustrated in Figure 4.13 show that substantial changes would be required in tourism practice if the target was applied consistently and the achievement of reductions was spread evenly across all industrial sectors. At present, it is not spread evenly and tourism is not acknowledged as an individual sector in national economic or carbon accounts.

Figure 4.13: Exploring the impact of CO_2e reduction targets



Source: Author

The mitigation strategies fit into two broad categories: those that work to change visitor behaviour and consumer choices that lead to a lower emission impact; and those that change business practice and choice in ways that lead to more efficient practice or technologies that decarbonise energy and transport.

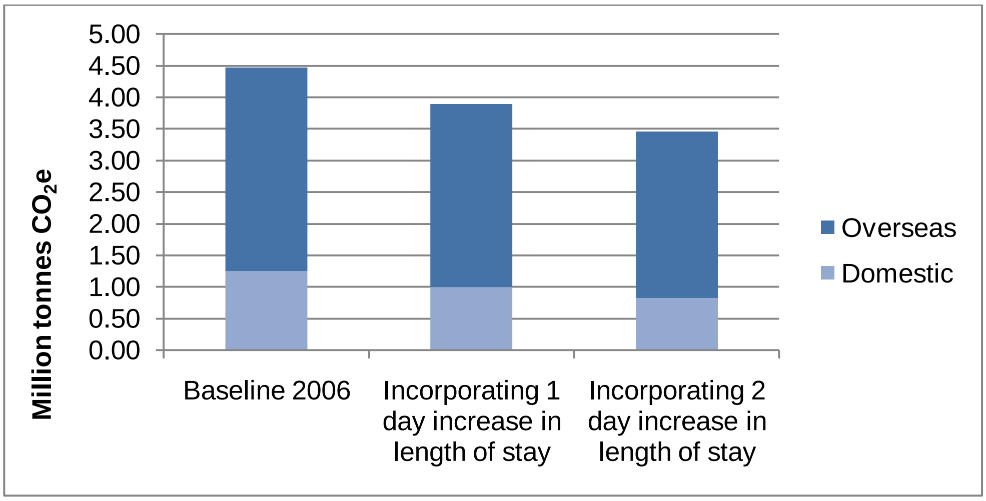
4.6.2 Changes in Visitor Behaviour

Changes in the behaviour of visitors and the tourism industry can be influenced by the actions and activities of DMOs. For example, DMOs could be target-marketing the domestic market and local residents, as opposed to long haul overseas markets with a high carbon impact. They could also be encouraging visitors to stay for longer, promoting 'local' services and green accommodation providers, incentivising public transport, and discouraging use of the private car. This requires a mix of marketing and product development measures alongside a refocus of tourism strategy and plans. The profile function in REAP Tourism can be used to experiment with visitor behaviour and choice, and this section explores the potential impact on the carbon footprint of increased length of stay, changes to transport mode and buying 'local' products.

4.6.2.1 Increasing length of stay

The impact of increasing the average length of stay of visitors by one and two nights is illustrated in Figure 4.14. The average length of stay in the South West for 2006 was 3.85 days for domestic visitors and 8.97 days for overseas visitors (South West Tourism, 2008). To model increased length of stay it is logical to assume that if visitors stay longer, the total number of unique visitors will reduce for the baseline number of visitor nights to remain constant (for comparison). Using the scenario function of REAP Tourism, the impact on transport emissions of increasing the length of stay of overseas and domestic staying visitors was explored. The total distance travelled to and from the region, is a function of the average distance travelled by each visitor and number of visitors. This means that, overall, the total distance travelled by all visitors will drop by the same proportion as the number of unique visitors. The revised kilometres travelled by each mode were calculated and entered into REAP Tourism to examine the impact on emissions (corresponding to a one and two-day increase in length of stay).

Figure 4.14: Carbon footprint of travel from increasing the length of stay



Source: Whittlesea and Owen (2012), Appendix 7
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Increasing the average length of stay by one or two days, reduces the transport component of the CO_2e footprint (in turn reducing the overall footprint) for both overseas and domestic staying visitors. The reduction is approximately 581,000 tonnes of CO_2e (13%), or 1 million tonnes CO_2e (23%) respectively (Figure 4.14).

Overseas visitors account for only 20% of staying visitors, but the absolute reduction in emissions is higher than domestic visitors by 20% (additional 64,000 tonnes) for a one day increase and 27% for two days (additional 158,000 tonnes). This is due to the much higher 'per visitor day' transport footprint of 160.93kg CO_2e over the domestic 16.02 kg CO_2e. These results would suggest that tourism marketing strategies should encourage overnight visitors to stay longer to reduce impact, especially those travelling from overseas.

As Table 4.5 demonstrates, increasing visitor length of stay can also reduce the CO_2e footprint of visitors. Despite domestic visitors having a significantly lower baseline total and PVD travel footprint than overseas, the proportional decrease in emissions from increasing length of stay by 1 (21%) and 2 (34%) days is greater than overseas, which is 10% and 18% respectively. This is because of the larger number of domestic visitor nights and the lower baseline length of stay, so an increase of only 1 night has a notable effect.

Table 4.5: Carbon footprint of staying visitor travel from increased length of stay

	Overseas		Domestic	
SW STAYING VISITORS TRAVEL FOOTPRINT	**Total CO_2e (t)**	**Per Visitor CO_2e (kg)**	**Total CO_2e (t)**	**Per Visitor CO_2e (kg)**
Baseline 2006	3,218,520.90	160.93	1,253,781.86	16.02
Incorporating 1 day increase in length of stay	2,895,700.35	144.79	995,270.14	12.72
Incorporating 2 day increase in length of stay	2,631,734.96	131.59	825,138.49	10.54

Table 4.6 shows the impact of increasing the length of stay on the total and PVD SW visitor footprint results (not just looking at the impact on the travel component). Increasing the average length of stay by one or two days reduces the overall CO_2e 2006 baseline footprint for staying visitors (overnight and domestic visitors combined) by 8% or 13% respectively.

Table 4.6: Impact of increased length of stay on the CO_2e footprint

	Overseas		Domestic	
SW STAYING VISITORS OVERALL FOOTPRINT	Total CO_2e (t)	Per Visitor CO_2e (kg)	Total CO_2e (t)	Per Visitor CO_2e (kg)
Baseline 2006	3,928,323.73	196.42	3,846,599.41	49.15
Incorporating 1 day increase in length of stay	3,605,503.17	180.28	3,588,087.69	45.85
% difference from baseline	-8.2%		-6.7%	
Incorporating 2 day increase in length of stay	3,341,537.78	167.08	3,417,989.16	43.67
% difference from baseline	-14.9%		-11.1%	

4.6.2.2 Changes to transport mode

Travel has been identified as a significant contributor to the size of the footprint, a consequence of the number of km travelled and the carbon impact per km associated with each mode (conversion factor). Table 4.7 provides the conversion factors for different modes of passenger transport, from high to low impact. The average car is highest. However, this is misleading, as aviation does not include the 9-10% uplift factor (to take into account non-direct routes, delays and circling) or the additional 2-4 times estimated additional impact of Radiative Forcing (RF) (DEFRA, 2007).

Table 4.7: Passenger transport conversion factors[50] and proportional km

Transport Mode	% Visitor km	kg CO_2 per km	Impact of 1,000,000 km
Average Car *(unknown fuel)*	26.6%	0.2075	20,750
Domestic flights *(UK airports)*	1.8%	0.158	15,800
Short haul international flights (*Europe*)	58.1%	0.1304	13,040
Long haul International flights (*non-European*)		0.1056	10,560
Bus (*local and long distance*)	3.5%	0.0891	8,910
National Rail	4.3%	0.0602	6,020

Public transport modes such as bus or rail have the lowest impacts per km, so shifting a proportion of car and aviation km (travelled by visitors), to public transport modes, could result in significant reductions. The proportional amount of km for these modes is relatively low, so there is potential to expand. For example, if one million car km were converted to train km (*representing only 0.02% of day visitor km*), it could lead to a saving of 147 tonnes CO_2. Equally, if one million km from short haul international flights were converted to train (for example targeting the European market to travel by Eurostar), then approximately 70 tonnes CO_2 could be saved (*142 tonnes if the minimum RF and uplift factors are included*). This may appear to be relatively small, but 140 tonnes of CO_2 equates to 2846 domestic visitor days, and would require 7000 trees growing for a year to offset[51].

These results suggest that destinations pursuing a low-carbon economic system should explore and exploit local and domestic source markets, rather than the current focus on those from overseas. In addition, developing and promoting low-carbon transport products and services, and working to reduce the total km travelled by high impact modes, could work to mitigate emissions. Section 4.6.3.2

[50] Conversion factors sourced from Defra, 2007
[51] 1 tonne of CO_2 = 50 trees growing for one year. Climate Neutral Group: http://climateneutralgroup.com/en/how-much-is-1-tonne-of-co2/

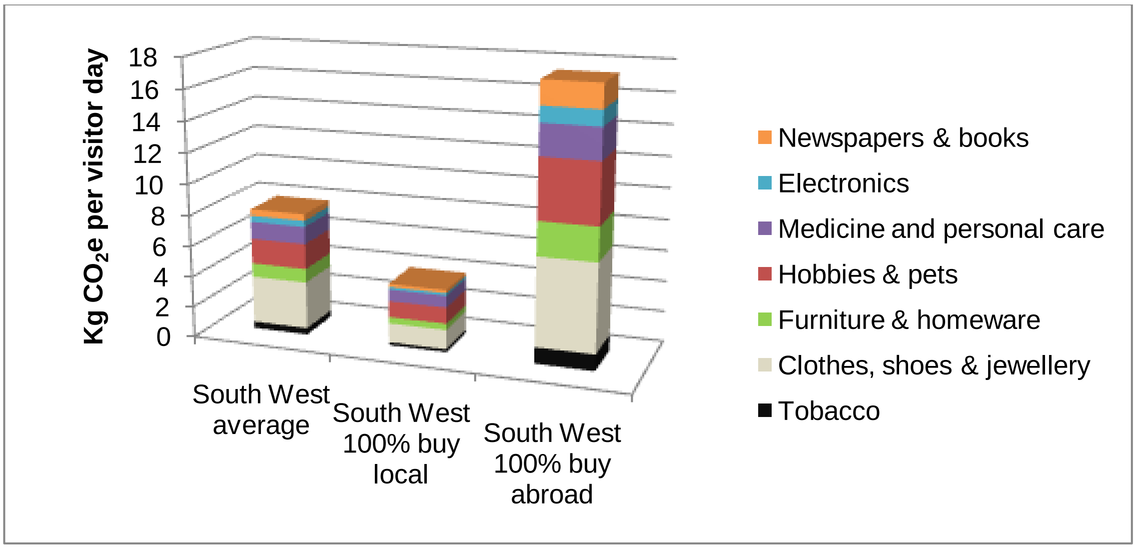
and Figure 4.18 explores the impact of reducing the total km travelled from primary transport modes.

A focus on local and domestic visitor markets could reduce CO_2e levels for the South West visitor economy (depending on numbers and visitor types), and could reduce the tourism deficit and global CO_2e levels if UK residents choose to take domestic holidays over a trip abroad. However, if UK visitors were displaced from trips abroad, the growth could result in an increase in net CO_2e for tourism in the SW if per capita impact remained the same, but the displacement could lead to gross global CO_2e savings which should be recognised. Equally, a reduction in long haul visitors to the South West would not necessarily mean a gross global CO_2e reduction if they were displaced to another destination.

4.6.2.3 Local procurement

Figure 4.15 illustrates the CO_2e footprint of shopping and considers an average South West day visitor (who typically has the highest PVD and highest proportional expenditure on shopping), a day visitor who buys the same products which are 100% made in the UK, and a day visitor who buys the same products imported from abroad. The average shopping impact of day visitors to the South West is estimated at 7.98 kg CO_2e per visitor day. This impact is more than doubled if products are bought from abroad yet, can almost be halved if a visitor buys products made in the UK.

Figure 4.15: CO_2e footprint of alternative day visitor shopping profiles



Source: Author, updated from Whittlesea and Owen (2012), Figure 4, p856
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Whilst a switch to '100%' local products is unrealistic, if the proportion of local products can be increased by any margin it will result in visitor CO_2e savings. In addition, 'buying local' can help retain money in local economies, in turn having social benefits through employment and community investments. REAP Tourism can also be used to examine reductions in the CO_2e footprint from buying local food or from visitors choosing low meat diets. If both visitors and businesses increased the use of local supply chains, services and products, then reductions in CO_2e could be achieved.

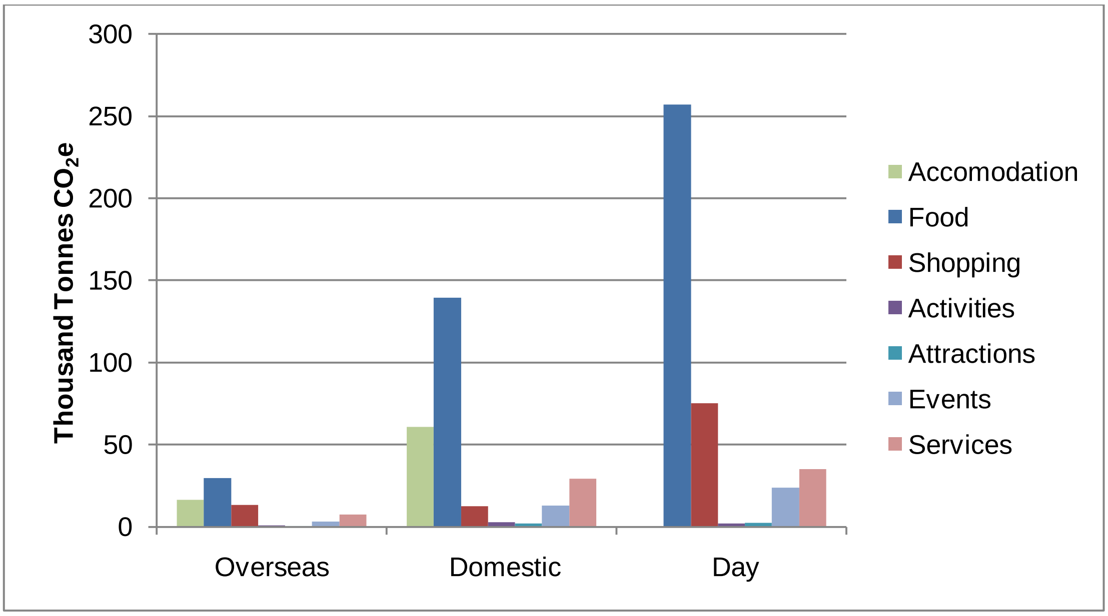
4.6.3 Changes to technology and business practice

Visitors, as consumers, have considerable power to reduce their carbon footprint through purchasing decisions. In addition, the businesses that provide or produce those services and products have power to alter their practices and reduce impact. Destination Management Organisations have the potential to inform, influence and facilitate businesses to procure local products and services, generate or procure low-carbon energy, and reduce use of energy and resources.

4.6.3.1 Greener business practice

Figure 4.16 investigates the impact of reducing the carbon intensity of business practice by 10%. The saving is applied across seven of the eight themes within the tool, including services but excluding travel which has been modelled separately. The results show that the footprint was most significantly reduced for the day visitor (395,683 tCO_2e) and domestic visitor (259,282 tCO_2e). Across all the visitor types, reducing carbon intensity has the most impact on reducing the visitor food footprint, saving around 426,132 tCO_2e. This is more than 4 times the saving of the next category of shopping which saved 100,888 tCO_2e, followed by accommodation with a saving of 77,442 tCO_2e. The modelling shows that the CO_2e saving from reducing the carbon intensity of services (71,794 tCO_2e) is similar to that achieved from accommodation and is important to consider, especially as DMOs may have direct control or influence over energy supplies to some of these services, for example car park and waste management. The total saving is estimated to be 725,945 tCO_2e or 1,088,917 tCO_2e if the carbon intensity was reduced by 10%.

Figure 4.16: Total CO_2e saved from reducing carbon intensity by 10%

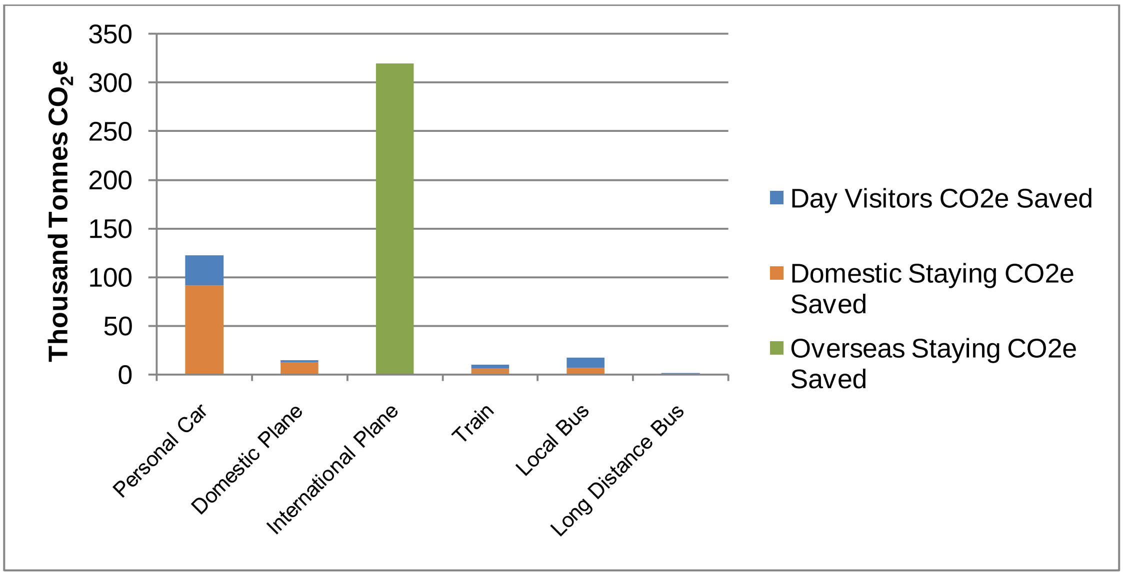


Source: Author

4.6.3.2 Greener travel practice

Figure 4.17 investigates the impact of reducing the carbon intensity of travel by 10%. The modelling investigated six predominant modes of travel and found that the most significant saving came from reducing the carbon intensity of the international plane (319,839 tCO_2e), 62% more than the second largest saving which came from the personal car (122,166 tCO_2e). The results correspond to the carbon impact of these modes, but they also correspond to the amount of km travelled.

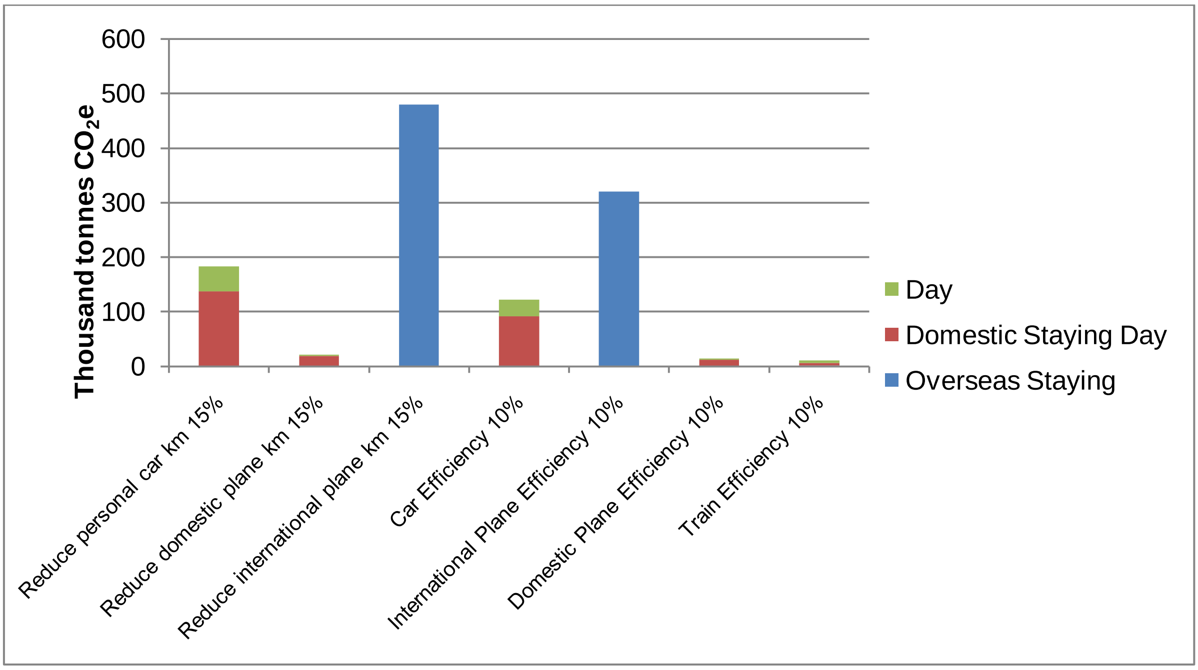
Figure 4.17: CO_2e saved from reducing the carbon intensity of travel by 10%



Source: Author

Figure 4.18 compares the transport scenario modelling results, and shows the CO_2e savings from decarbonising the energy intensity (by 10%) and reducing the km travelled (by 15%) of primary modes of passenger transport. If these mitigation policies were combined, they lead to an estimated saving of 1,151,958 tCO_2e. Reductions in emissions are mainly associated with aviation (69%) followed by car use (27%).

Figure 4.18: CO_2e saved from different transport mitigation policies



Source: Author

4.6.4 Comparing and combining mitigation policies

The modelling results illustrate the estimated impact of different mitigation strategies and how they may affect the absolute and relative CO_2e footprints in distinct ways. This could provide a useful foundation to inform stakeholder discussions and debates around carbon mitigation in tourism destinations. It could also be helpful to compare and combine strategies, to investigate what cumulative impact this would have by 2020, and whether a 34% reduction in line with the Government's target is appropriate and achievable. The 2006 baseline indicates that tourism in South West England emits over 12.3 million tonnes of CO_2e per year. By 2020, this would need to reduce to 8,118,000 tonnes of CO_2e per year if the Government's 34% reduction target was applied and achieved. This would translate to average PVD carbon footprints of 129.64 kg CO_2e for overseas visitors, 32.44 kg for domestic staying visitors, and 31.52 kg for day visitors. However, the sector is anticipated (and strategically directed) to grow in that time, with current targets standing at 3% per annum.

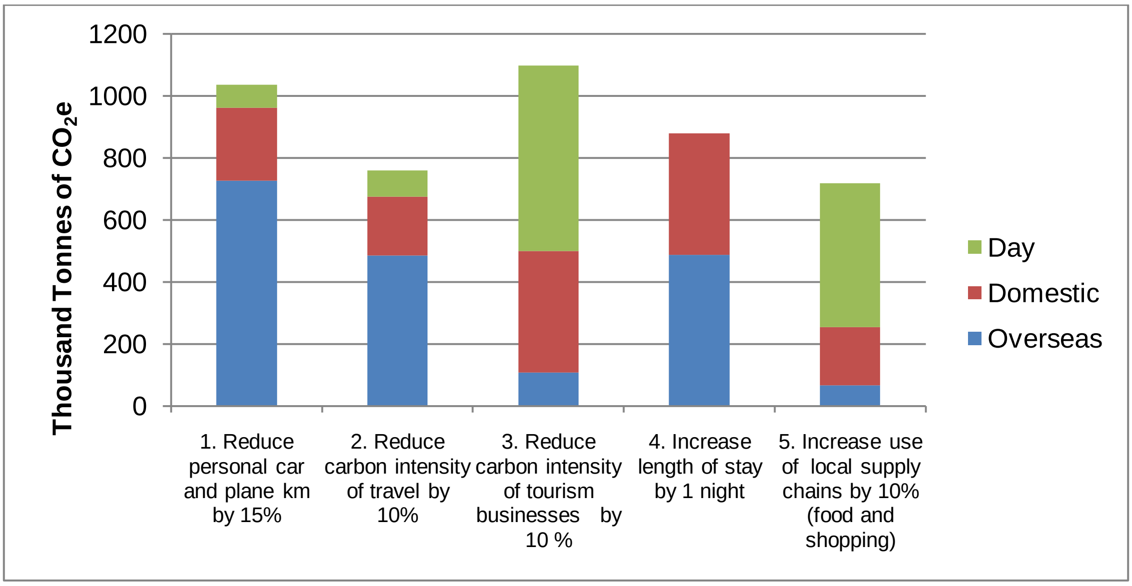
Table 4.8 presents five mitigation strategies aligned to associated targets. The impact of these was modelled and Figure 4.19 illustrates the results.

Table 4.8: Proposed carbon mitigation policies and targets for tourism

Proposed mitigation policy	REAP Tourism modelling	Relevant or related National policy	CO_2e Saved (t)
1. Reduce personal car and plane km by 15% (behavioural change)	All personal car, domestic and international plane km reduced by 15%	UK Low Carbon Transport Strategy, sets out to cut emissions from domestic transport by 14% on 2008 levels (Department for Transport, 2009)	1,036,028
2. Reduce carbon intensity of travel by 10% (behavioural and technological change)	Energy intensity of all travel modes decreased by 10%	UK Low Carbon Transition Plan commits to source 10% of the UK transport energy from renewable sources by 2020 (HM Government, 2009a)	760,322
3. Reduce carbon intensity of tourism businesses and services by 10% (behavioural and technological change)	Carbon intensity of accommodation, catered food, grocery food, shopping, activities, attractions, events and services decreased by 10%	UK legally binding target commits to source 15% of all energy from low carbon renewable sources by 2020 (HM Government, 2009b). The Government has also set out to reduce office emissions by 10% in 1 yr (DEFRA, 2011)	1,098,204
4. Increase length of stay by 1 night (behavioural change)	Retaining total number of nights, but increasing the average length of stay by 1 night, so reducing future number of trips and associated km travelled.	Historic trends obtained from South West Tourism show an increase in length of stay by 1 day to be a reasonable target for both overseas and domestic visitors	879,317
5. Increase use of local supply chains in shops and grocery stores by 10% (behavioural change)	Use of local supply chains for grocery food and shopping were increased by 10%	No formal targets have been set but it is recognised that UK food system CO_2e needs reducing (Williams et al, 2010) and Government procurement commitments are to reduce emissions and publish data on supply chain carbon impacts (DEFRA, 2011)	719,660

If all the mitigation policies are activated and effectual, an estimated saving of approximately 4,493,531 tCO_2e could be made, comprised of 42% from overseas visitors, 31% from domestic visitors, and 27% from day visitors. From the 2006 baseline this would correspond to a CO_2e emission reduction of 37%, exceeding the Government's target. The policy having the most significant impact is reducing the carbon intensity of tourism businesses by 10% (24% of the footprint), closely followed by a 15% reduction in plane and car km (23% of the footprint), and then extending the average length of stay by 1 day (20%). All of the five policies, however, lead to a considerable reduction.

Figure 4.19: Total CO_2e saved from five mitigation strategies



Source: Author

4.6.5 Growth Scenarios

The success of the tourism industry is measured primarily by economic and growth related indicators including tourist arrivals (nights and trips), expenditure per head, contribution to employment and the monetary value of its services (Gross Domestic Product and Gross Value Added). These indicators drive tourism strategy, policy and target setting globally (UNWTO, 2013). The national 2020 growth target for tourism in England is 3% growth in value of visitor expenditure per annum (5% including inflation) (VisitEngland, 2011).

Most destinations and other stakeholders utilise this national target, whilst acknowledging that individual destinations have different growth potentials (South West Tourism Alliance, 2011). The growth scenarios that were investigated for this research align with the national growth target, as they are reflected at the SW regional level (South West Tourism Alliance, 2011) and by some sub-regional destinations (Bath Tourism Plus, 2012).

It is difficult to model the impact of growth in 'value' (£) using REAP Tourism, as value is not currently a defined parameter in the user interface. The predominant parameter within the tool is visitor 'nights'. An indicative impact of growth can be achieved however if 'value' is aligned with 'volume', so assuming that expenditure, behaviour and conversion factors remain constant, growth in 'nights' and the consequent impact can be explored. In reality it is likely that visitor types and consumer behaviour, choice and expenditure will vary to some extent, so the different growth scenarios explore the impact of increases to visitor nights, but also the impact of different proportional mixes of types (day, domestic staying, and overseas staying).

Section 4.3 (Figure 4.9) demonstrated that domestic visitors have the best eco-efficiency rating, so the proportional mix of types is an important consideration. Targeting local and domestic visitors instead of those from overseas encourages UK residents to visit the South West of England. This could have a four-fold benefit. Firstly, it could reduce the national tourism deficit by redirecting the lost expenditure back into the UK economy if citizens holiday at home instead of abroad. In 2006, the deficit was estimated at £18 billion, although in recent years this has reduced by around £3 billion (VisitBritain, 2013). Secondly, it could increase tourism expenditure as domestic staying visitors spend more PVD. Thirdly, it could reduce the CO_2e impact of total and per capita emissions of the visitor economy, whilst at the same time, the fourth benefit is reducing net global emissions from the prevention of flights overseas.

Table 4.9 illustrates the CO_2e results of four different growth scenarios modelled, based on an exponential growth rate of visitor nights per annum, against the 2006 baseline results for the South West. Scenario 1 applied a growth rate to visitor nights of 3% per annum for all visitor types in line with regional and national targets. Scenario 2 applies a lower growth rate of 1.5% per annum. Scenario 3 applied a higher growth rate of 4.4% to overseas visitor nights and a reduced rate of 2.6 % for domestic visitor nights reflecting the associated changes in spend forecast by Deloitte (2010). A 3% growth rate is applied to day visitors. Scenario 4 applies a 3% growth rate to domestic and day visitor nights and replaces the 3% overseas growth with equivalent domestic market growth. Overseas visitor nights remain at 2006 levels. The increase in nights was calculated from the 2006 baseline through to 2020.

Table 4.9: The carbon footprint of different growth scenarios

	Tonnes of CO_2e				
2020 Growth Scenarios	**Overseas**	**Domestic**	**Day**	**Total CO_2e**	**CO_2e % Change**
2006 Baseline	3,928,324	3,846,599	4,511,130	12,286,053	
Scenario 1 **3% growth per annum**	5,941,942	5,818,327	6,823,489	18,583,757	51.3%
Scenario 2 **1.5% growth per annum**	4,982,809	4,879,147	5,722,058	15,584,014	26.8%
Scenario 3 **2.6% domestic, 4.4% overseas, 3% day**	6,986,951	5,552,899	6,823,489	19,363,338	57.6%
Scenario 4 **3% growth all domestic**	3,928,324	6,322,225	6,823,489	17,074,037	39.0%

Source: Author, adapted from Whittlesea and Owen (2012), Appendix 9
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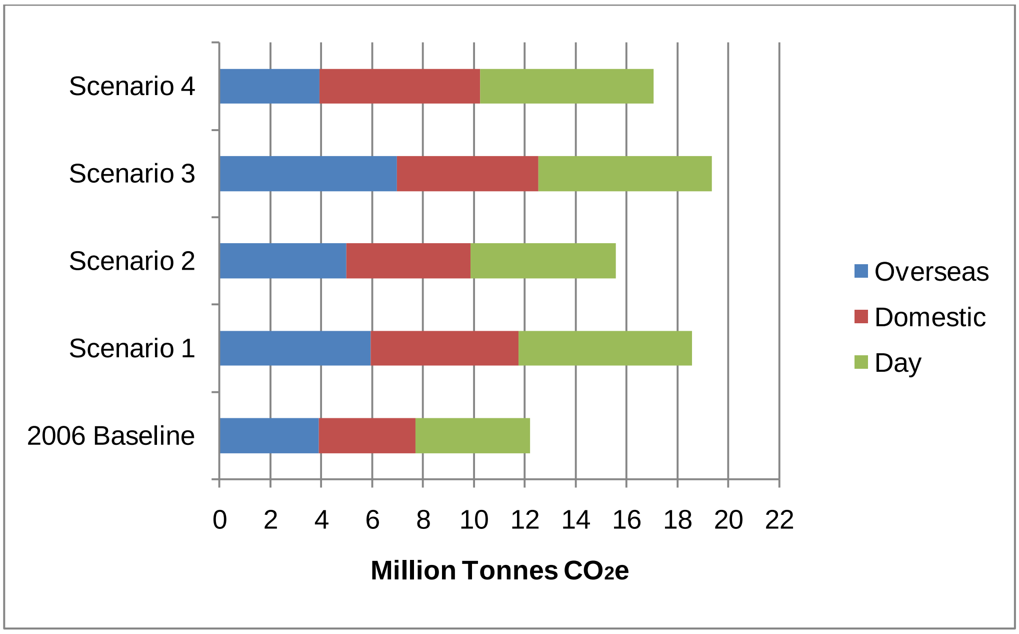
Figure 4.20 presents the results, examining the different growth scenarios and proportional mixes of visitor types. Unsurprisingly, scenario 2 with the reduced growth rate of 1.5% had the lowest increase in CO_2e of 27%. Changing the proportions of visitor types also had an effect, as scenario 4 retained the same visitor night growth levels as scenario 1 but the percentage change in CO_2e emissions is 12% lower due to the increase in overseas staying visitor nights being shifted to domestic. Scenario 3 had the highest emissions impact, with a 58% increase in CO_2e from the increased proportion of overseas visitors forecasted by

Deloitte. These results present challenges for tourism economies seeking to grow visitor numbers or nights (or expenditure), whilst at the same time reducing greenhouse gas emissions. In all the 2020 growth scenarios modelled, the emissions had increased significantly and make the 34% emission reduction target improbable.

Figure 4.20: Total CO_2e footprint for four alternative 2020 growth scenarios



Source: Adapted from Whittlesea and Owen (2012), Figure 5, p859
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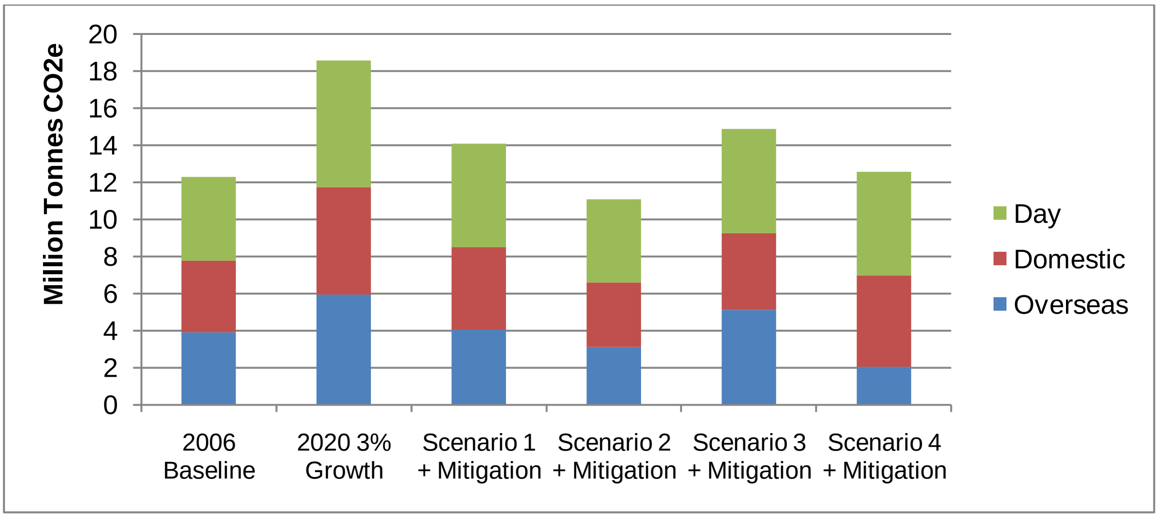
To achieve absolute and relative PVD emission reductions, the impact of different levels and types of growth need to be understood. The impact of the current 3% growth target (if business continues as usual) would seem to negate action to mitigate. It would appear that for a low-carbon tourism economy, the traditional interpretation of growth and current targets need to be revisited, alongside a reduction in the carbon intensity of tourism products, services and associated expenditure.

4.7 Combining Growth and Mitigation

A primary challenge for a low-carbon tourism economy is that increases in expenditure (value in £) and visitor numbers/nights are directly related to increased impact and emissions (at present). The modelling of the CO_2e impact of different future scenarios can help to understand whether this relationship can be decoupled towards an inverse relation. This section explores whether tourism 'value' and/or 'volume' can be increased (*the focus of most tourism strategies*), and emissions reduced, if all the mitigation strategies are employed. The modelling explored four growth scenarios (section 4.6.5, Table 4.9) and incorporated the effect of the combined mitigation strategies. The results are compared to the 2006 baseline and the VisitEngland 2020 3% per annum growth objective. Figure 4.21 illustrates that the inclusion of mitigation, alongside growth in the modelling, reduced all of the scenarios below the 'typical' 2020 3% growth scenario. However, only growth scenario 2 which halved the growth rate to 1.5%, combined with the five mitigation measures, achieved a reduction below the 2006 baseline, leading to an estimated saving of 9.7% (1,195,570 tonnes).

Figure 4.21: Impact of combined mitigation and growth scenarios for 2020



Source: Author, updated and adapted from Whittlesea and Owen (2012), p859

The modelling has indicated that growth alongside a 34% CO_2e reduction by 2020, requires significant mitigation effort and changes to visitor characteristics and the tourism products and services offered, if a low-carbon economy remains a national objective. If nothing changes to reduce the carbon intensity or emissions released from the tourism system, then it would seem that the annual 3% tourism growth target may need to become a 3% de-growth target. Growth inhibits the opportunity to be able to reduce emissions from the visitor economy below the 2006 baseline. Even 1.5% growth combined with all 5 mitigation policies only achieved a 9.7% saving, suggesting a steady-state (no growth) or de-growth strategy is the appropriate pathway for a low-carbon economy and society.

4.8 Benchmarking

Benchmarking is often used to assess tourism management and enhance tourism sustainability performance (Bosetti, Cassinelli and Lanza, 2006). This study has applied a methodology which enabled benchmarking for the different destinations and sub-regional geographic areas within the South West (Figure 4.6 and 4.7). However, this was not possible beyond the South West using existing studies, in part because of the limited destination studies of this nature, but more importantly because fundamentally different carbon accounting methodologies were employed (see section 2.4.4, Table 2.4). Although the findings can be applied, and areas of commonality or conflict identified, it would be unscientific to benchmark or directly compare these results with other studies, without due consideration of the methods, data and scope employed (due to the complexities identified). This could be an area for future research.

It would be useful to have more recent data and emissions factors to be able to undertake comparisons against the 2006 baseline data, to see if the footprint size and composition changes much over time. This would be subject to a successful update of tourism data and conversion factors within the REAP Tourism tool and is also an area for future research.

4.9 Chapter Summary

The results show distinct differences between destinations in terms of the size and constitution of their visitor CO_2e footprints, whether looking at absolute or relative values. Absolute values are helpful for scenario planning and exploring overall reductions in emissions, but the relative 'per day' values are crucial in understanding the makeup of the footprint and the variation in visitor impact for different destinations. The variation is due to different types of visitors and the proportional components of the footprint. The choices visitors make on travel, eating out, accommodation, shopping and activities, directly affects the size of their CO_2e footprint.

Understanding the thematic profile of the footprint could inform tourism management and mitigation effort as it allows a deeper investigation of the high impact areas for priority. Having more detail on the impact of visitor consumption and the impacts of different visitor profiles, holidays and events can help destination managers understand the relative impacts to inform strategic planning. The results demonstrate that some visitors and products have the potential to be both high value (£) and low CO_2e impact. This warrants further investigation.

Reducing the CO_2e impact of tourism is not just an environmental and technical challenge, but also a behavioural and social one. To achieve a reduction, it appears there need to be significant changes in tourism practice, the strategic management of destinations, and visitor characteristics and choice. The CO_2e modelling using the REAP Tourism tool indicates that a combination of mitigation strategies applied to the 2006 baseline makes it possible to achieve the necessary carbon reductions (34%). However, the results show that a key challenge to reduce the CO_2e impact of visitors is 'growth', as current tourism growth targets contradict and are in conflict with CO_2e reduction targets.

Alternative low-carbon growth strategies need developing and testing (including steady state and de-growth options), for example, targeting lower impact visitors and developing lower impact high-spend products, packages and services. In addition, integrating carbon mitigation strategies into destination management and planning, such as reducing the amount of km travelled by plane and car 'to and from' the destination, and increasing length of stay, can achieve reductions in the visitor footprint, but these need to be combined to have a noticeable effect.

The scenario modelling helps identify how growth could be redefined and decoupled from increased CO_2e. For example, the adoption of eco-efficient practices and measures could help develop a more complementary relationship between the two objectives (economic prosperity and environmental improvement). Recognising and internalising the environmental costs within destinations by formulating targets and assessing performance is likely to be a key component to progress. However, effecting these changes will require organisations to allocate sufficient time and resources.

The results of the REAP Tourism modelling presented in this chapter provide interesting insights and challenges. These findings were used to inform the design and delivery of two stakeholder workshops and 16 stakeholder interviews to explore the implications and practicalities further. The results of these qualitative stages of the research are discussed in the next chapter.

5 Qualitative Results

5.1 Introduction

This chapter analyses results from the qualitative stages of the research which engaged tourism stakeholders. The results reflect the outcomes of the thematic analysis, drawing collectively from the participatory workshops, individual evaluation questionnaires and semi-structured interviews. The respondents' phrases and terms formed the basis of the thematic categories used to present the results and quotations used to illustrate and reinforce findings. This approach was applied to reduce researcher influence and retain original concepts and participant descriptions.

The two stakeholder workshops generated data from ten facilitated small groups. The main source of workshop data for the coding analysis was flip chart notes (see Appendix 10). The findings are presented in the following sections, using direct excerpts to illustrate key points (referenced to the appropriate group[52]). Thirty-four workshop participants completed the evaluation questionnaire[53] and the results were analysed in Survey Monkey and in Excel (see Appendix 11a). Mind maps were produced to illustrate and identify thematic clusters and links (see Appendix 11b).

Sixteen semi-structured interviews with tourism stakeholders were used to further examine and enrich workshop findings. A summary of the NVivo interview codes and cluster models can be found in Appendix 12 and were used to inform this

[52] Cornwall Workshop (CW): BD Blue Dots; BS Blue Stars; GS Green Stars; YS Yellow Stars; OD Orange Dots; RS Red Stars
Tiverton Workshop (TW): GG Green Group; BL Black Group; BG Blue Group; RG Red Group, CB Comments Board.

[53] Evaluation questionnaire quotations are depicted by CW for the Cornwall Workshop and TW for the Tiverton Workshop followed by the number corresponding to the evaluation questionnaire.

chapter using interview quotes[54] to support the interpretation of the data. The results from each qualitative method were analysed independently but triangulation and cross-verification of the data strengthened and validated the results.

This chapter is divided into three main sections. The first (5.2), explores the stakeholder views and perceptions on the effectiveness of the carbon footprint data, responding to the first research question. The perceived usefulness, relevance and applicability of the REAP Tourism carbon footprint results, is also considered. The second section (5.3) investigates the opportunities and challenges in response to the second research question and examines stakeholder perspectives for progressing to a low-carbon tourism system. The third and final section (5.4) provides a synthesis of the chapter.

5.2 Effectiveness of the Carbon Footprint

5.2.1 Evidence and direction for management

The presentation of the carbon footprint data and scenarios in the workshops were viewed by participants of the workshops as “coherent” and useful for “perspective and focus” (CWBD), a useful driver for “evidence based decision making” (CWBS), and “vital to measure targets” (TWBG). The data helped participants “identify areas which they can control”, demonstrate where emissions needed to be reduced (CWBD) and where interventions could be applied (CWOD). Participants felt the data formalised the existence of carbon through “an articulation of the issue at hand” (CWRS) and provided a “clearer idea of problem areas and provoked discussion into how best to tackle them” (CWRS). Scenarios motivated and engaged stakeholders (TWBL) and the results could help to influence policy (CWBS) and “influence politicians to make change” (CWBD).

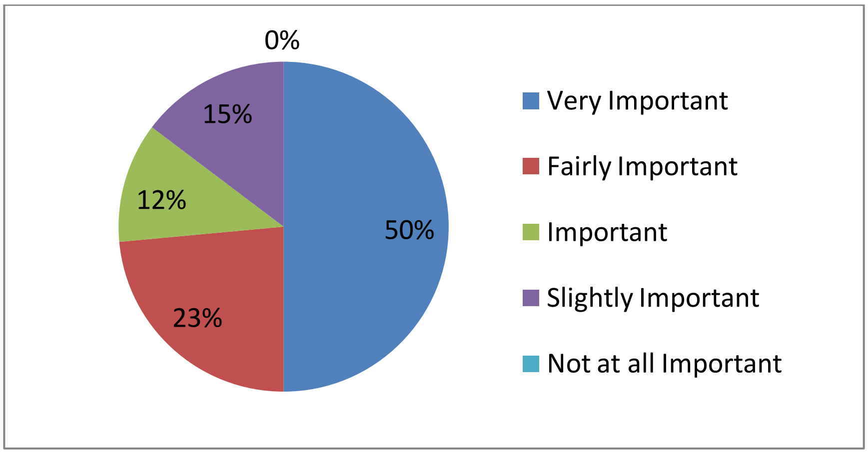
[54] Interview quotes are depicted by an interview number in brackets from 1 to 16 to illustrate coverage and representation.

A consistent finding from workshop groups was that carbon emissions should be a key performance indicator and management aid, as “measurement means the ability to start managing” (CWBS). It formalised the existence of carbon: “proving its worth in terms of what the reduction is and what it physically means and getting people to take it seriously” (7). Respondents suggested that the carbon footprint data provided clarity of direction: “in terms of destination managers, it is making it visible so that it actually does make a difference” (9) and “I think it would give us more structure in how we talk about being sustainable. Because at the moment it is all a bit vague, it has all gone on an assumption and a basic knowledge and I think it would give us a lot more facts to work with, and a bit more direction... it really is just a case of we need to have that information” (14).

From a management perspective, participants suggested that the data and scenarios could be used to inform business and strategic planning – for example, encouraging local markets and longer stays (TWBL, CWBS). Additional suggested uses for the data were for target setting, benchmarking, policy development, development applications, procurement, damage limitation, travel, and energy management (TWBL, TWRG, TWRG, CWOD, 11, 12).

Figure 5.1 quantifies responses from the stakeholder evaluation questionnaire (N:34) considering how important it was for tourism to measure and manage its carbon footprint. None of the participants responded that it was not at all important, although 15% chose *slightly important*. The results showed that 50% thought it is *very important* for tourism to measure and manage its carbon footprint, with a further 35% thinking it was *important* or *fairly important*.

Figure 5.1: Importance of tourism measuring and managing its carbon footprint



Source: Author

The findings implied carbon measurement should be a key component of destination management: “A DMO done well could have an impact on carbon reduction and I think that is the most important aspect to this” (16), a view supported from a national perspective: “for DMOs to be able to manage their destinations effectively they need to have the right information and I think carbon footprinting information would contribute significantly to managing a destination better and providing better visitor experiences… using tools like footprinting could help them enormously, but the reality is most of them hardly measure anything. You know, they don’t really understand the basics and there is a real challenge of understanding why they should measure anything in terms of management” (2).

Additional cautionary comments arose: “be aware of quantificationitus” and “be mindful of being carbon blinded as there are many other environmental impacts” (CWOD). The interview responses supported this further, suggesting carbon measurement should be addressed, but not in isolation from other impacts and the wider sustainability agenda (10). In addition, a few respondents suggested data demonstrating a low-carbon destination would not make much difference to consumer choice and would only influence a small proportion of visitors (13, 15, 16). Others suggested it was an important consideration for visitors and a good headline (9); for example: “I think many visitors and businesses understand the general concept that reducing our carbon footprint is important and more and more consumers, particularly when they travel, are aware of the cost of that to the environment” (4).

5.2.2 Improving the carbon footprint

The workshops captured participants’ views on what could be done to improve the usefulness and applicability of the carbon footprint data. A common suggestion was to target information and ensure specificity, that data needed to be relevant and tailored for particular audiences and tourism sub-sectors (TWGG, CWYS, CWOD, CWRS, CWBS). Another, was that footprint data needed to provide industry detail to enable comparison (CWOD, CWGS, CWBD, CWBS), and identify whether tourism was significant in comparison to other industries (TWBG). Additional approaches for portraying carbon data were proposed, specifically, the need to demonstrate the economics of carbon reduction, the savings and positive messages (TWBG). Some examples included kg CO_2e per mile (CWBS), linking kg CO_2e in terms of money (CWGS), such as CO_2e per £ (CWRS) and money retained in the local economy per kg CO_2e (CWBS, 1).

Suggestions relating to improving the REAP Tourism tool more specifically, were:

- the rebound effect needed to be better understood in order to make sure data were used in the right way and well (CWOD);
- it would be useful to demonstrate the emissions reduction impact of actions and to consider the time taken for that change, and where possible, to break down into milestones (TWBL, TWRG, CWBD);
- to have multiple options for change and to be able to evaluate and weight the results (CWOD).

Specific stakeholder queries generated from the workshop groups were:

- what proportion of the footprint components (aside from transport) were attributable to transport e.g. food miles (CWYS);
- could the data be updated, as 2006 was too old to be relevant when changing hearts and minds (CWGS, CWYS);
- could the footprint be calculated for boundaries beyond local authorities (TWBL);
- could more detail be provided to help understand the carbon footprint for food (TWBL, CWBS).

Participants felt interpretation of the data was important to create meaning and aid decision making (TWBL, TWBG, CWOD), and it was suggested that data should be published in public places to effect change (CWBD). In terms of presentation, a few groups made reference to "making the data fun" and accessible. A suggestion involved the use of technology and animation to facilitate access applicable to a variety of audiences and to use "inventive ways" (CWBD, CWGS). Examples included a website to calculate and compare footprints (TWRG), use of online resources to capture data (CWGS), visual graphics to improve graphical presentation (infographics) (CWRS) and to personalise the data using Flash Mobs (CWGS). Graphs were not felt to be user friendly (CWGS). Feedback included the "need to 'sell' it, big images and messages with an impact", for example, applying a rating to holidays like the ranking used on washing machines, making it easier to understand and to aid decision making (TWBG).

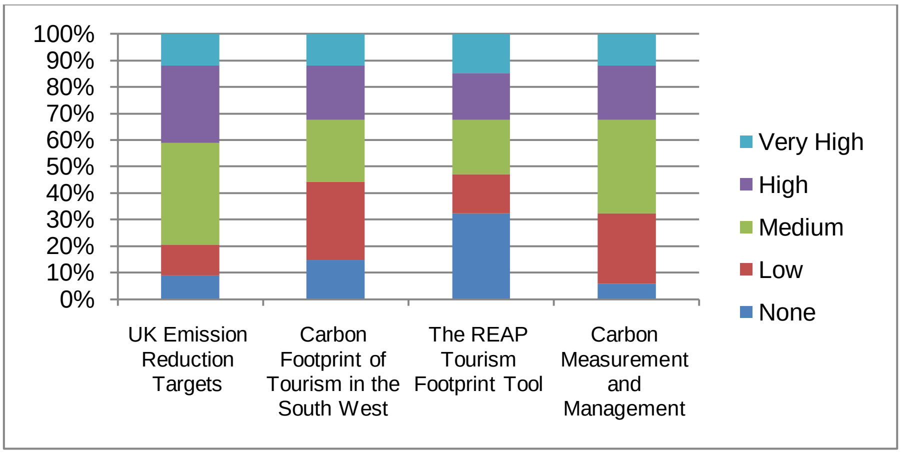
5.2.3 Importance of Stakeholder Dialogue

The workshops encouraged stakeholder dialogue, provided an opportunity to present the carbon footprint findings and gain insight into stakeholder perceptions. Discussion was facilitated around the data, the strategic opportunities and the challenges of carbon measurement and management at destination level. Workshop group discussions were supported by further data gained from individual stakeholders, through the workshop evaluation questionnaires and interviews. The evaluation questionnaire (questions 7 and 8) reviewed participants' level of knowledge and understanding, before and after taking part in the workshops. The questions asked about four areas:

- UK emission reduction targets;
- the carbon footprint of tourism in the South West;
- the REAP Tourism tool;
- carbon measurement and management.

Figure 5.2 illustrates that 79% of participants considered themselves to have Medium to Very High levels of knowledge of the UK emission reduction targets before taking part and 68% had Medium to Very High levels of knowledge for carbon measurement and management. The levels of knowledge however, were lower for the carbon footprint of tourism in the South West (56%) and the REAP Tourism footprint tool (53%), both specifically related to tourism's carbon impact. Overall, these findings suggested that workshop participants felt they were reasonably knowledgeable about the low-carbon agenda. This provided a degree of validity to the qualitative results through the evaluation of the participants knowledge (and thus expertise).

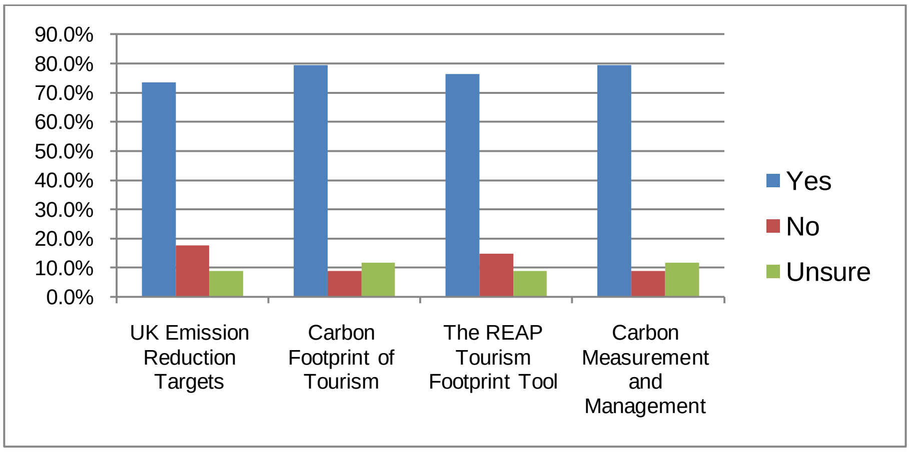
Figure 5.2: Level of knowledge before taking part in the workshops



Source: Author

Despite a good starting level, evaluation from participants indicated that the workshops increased knowledge for over 70% of participants (see Figure 5.3). The 'carbon footprint of tourism' (79%) and 'carbon measurement and management' (79%) were areas of knowledge enhanced most with less than 9% of participants not gaining further knowledge in these areas. Enhanced knowledge of the REAP Tourism Footprint Tool and UK Emission Reduction Targets were also high, 77% and 74% respectively. Those respondents selecting 'no' as their answer, identified either a 'very high' or 'high' level of existing awareness before taking part, with the exception of one respondent who had rated 'medium' (CW9). These findings indicate that carbon literacy can be enhanced through participatory workshops of this nature.

Figure 5.3: Effect of workshops on enhancing participant knowledge



Source: Author

Results demonstrated that the workshops increased stakeholder awareness and understanding of the low-carbon agenda and that the carbon footprint presentation and REAP Tourism data were interesting and useful: "I found the last slide of the presentation with options for the future most useful" (TW7). The workshops were also described as "thought provoking" (CW18) and participants "enjoyed the opportunity for debate" (TW13). The workshops prompted and promoted critical thinking, for example: "I would love to know if Eden Project has been surveyed for its carbon management, particularly with their events” (CW10) and “there are other environmental impacts we need to consider. Could an ecosystem services approach be the next step in evolving this work?” (CW4).

Participants appreciated the opportunity for open discussion and being able to reflect and talk freely about what was possible: “It was good to be able to have time to think about the bigger and longer term issues than being forced into short term thinking and action” (CW18) and “Trying to look at the big picture rather than small ones” (CW7). A few comments reflected a desire for answers and relevance to every day actions: “The research does not go into specific actions that can be taken” (CW2) and “I know it’s research but need a summary of what's necessary to hit targets” (TW13). The low-carbon agenda was clearly an area of interest and participants expressed a desire for feedback and to be kept informed (CW7, CW11, CW16, TW14).

5.3 Opportunities and Challenges

This section reviews the results in relation to the strategic opportunities and challenges associated with a transition towards a low-carbon tourism destination. All three qualitative methods explored strategic opportunities and challenges to differing extents, revealing considerable consistency and overlap in findings (Appendices10, 11 and 12). The headline themes arising from the workshop evaluation questionnaire were particularly useful because they captured individual participant views after they had taken part in the workshop and had time to reflect. This strategy enabled a degree of prioritisation as participants were asked to identify their ‘top two’ opportunities, challenges and most important actions in relation to improving carbon measurement and management in tourism destinations.

The mind maps created to examine emergent themes from the evaluation questionnaire (see Appendix 11b) revealed considerable commonality across the top two ‘opportunities’, ‘challenges’ and ‘most important actions’. Although the main themes did not align perfectly between the three areas of questioning, when tracked against each other they revealed consistent and recurrent themes within and across, the three areas (Appendix 11b). To an extent, linkages would be expected, as ‘challenges’ can often be redefined as an ‘opportunity’ for ‘action’. The findings, however, could have been influenced through workshops creating common-ground and/or inadvertently by the researcher’s interpretation of the data. The interviews were structured to examine the workshop findings in more detail and to enrich the interpretation.

A range of challenges and opportunities were identified and categorised which led to the emergence of the following eight variable orientated themes:

1. providing government leadership and strategic direction;
2. defining roles and regulating responsibility in tourism;
3. redefining tourism policy, priorities and plans;
4. demonstrating the business benefit and relevance;
5. managing destinations for low-carbon tourism;
6. providing resources, incentives and practical support;
7. coordinating standardised carbon measurement for tourism;
8. improving carbon literacy and low-carbon communications.

The findings and evidence will be examined in the following sections and have been structured by these eight major themes.

5.3.1 Government leadership and direction

Workshop feedback indicated a “lack of vision” in relation to low-carbon (TWBL), and “no commitment from the public sector” (CWGS). Participants suggested that “government intervention is the only way to make it happen” (TWRG) and there is a “need for urgency and public and private sector co-operation” (CW5). Concern was expressed as to “who is driving this forward?” (CWGS). The need for leadership and clear direction for carbon mitigation was a common theme during interviews (3, 4, 5, 9, 12, 15), “You have to set some standards and encourage people to follow the lead” (14). Some interviewees specifically alluded to a need for pressure: “It will only really happen when there is national pressure” (5); “We are not getting pushed to do it” (3); and “How do you change that for the long term unless there is either peer pressure or consumer pressure” (4).

VisitEngland and industry associations emerged as key enabling agents to provide strategic direction: “I think it is a national tourist board issue to set out how this is done. I think it has to be at that level and then rolled out to say ‘this is what you want, this is what we expect you to do” (8); “In a way my feeling is that VisitEngland or maybe the AA, or one of those organisations should be standing up and saying we are the leaders of this industry, this is our policy on low carbon, and this is what we do. I don’t see any of that at the moment at all (9)”.

The political landscape was identified as a barrier, participants suggested there was no political strategy or will to reduce carbon emissions in tourism (CWRG). This lack of political support was identified as a challenge: “Unfortunately the politicians were some of the worse aspects of the industry, it was all about marketing” (1). When probed about whether this has changed, the response was; “No, certainly not on carbon... it falls into the ‘too hard to deal with at the moment, I think, because funding is as tight as it is” (2). Interviewees suggested that if politicians did not see the importance of reducing emissions, then it was unlikely there would be a structured government response (5): "All you end up with is the words being used to satisfy everybody but the actions will not necessarily follow true. It is almost treated a bit like political correctness*"* (1).

The tourism industry was considered a critical barrier: "There is a lot of power and influence that some of those people have, and if they don't understand it, it doesn't happen" (2). Participants also identified the potential to drive change, and leadership by tourism organisations having the benefit of a "kinetic effect" (CWYS), one starts and others see (CWRS). Some of the comments reflected frustration around the lack of progress to date and the challenge itself, such as: "I despair we are still figuring out how to engage people on this" (CW19), the "scale of the challenge - particularly in lack of leadership and economic focus at the moment" (TW12), and "so little visible change can be seen" (CW3). Change did appear possible if leadership and direction were provided: "Things have changed in the industry but the driving force has stopped so business's eye has been taken off the problem" (TW3).

These issues were followed up in the interviews, but interviewees seemed to struggle with questions about strategic leadership for tourism and raised responses such as "and that is the easy opener" (11) and "that is a tricky one" (3). All those interviewed felt their organisation provided strategic direction and a leadership role for tourism to an extent, with national organisations displaying conviction: "Yes definitely" (13) and "yes, very much so" (2). At the national level strategic governance and leadership were clearly defined, whereby the Department of Culture, Media and Sport (DCMS) set broad strategic direction from a government perspective, primarily around growth and capitalising on the gains (refer to section 2.3.1). From the interviews, a participant indicated that DCMS have a management agreement with VisitEngland and VisitBritain to articulate and interpret the government's overarching direction and to lead on a broader range of strategies such as sustainability (13).

The interview responses about strategic leadership from those working in DMOs were less certain: "Yes and no" (1), "We would like to think we do" (7), "Yes, as much as we can" (5), "we do yes, sort of" (10). Links to strategy and plans were made with the notion that DMOs facilitate and advise on strategic direction, although this might not always be formalised: "There isn't one currently and it is difficult to see where that comes from because at a destination level, we are focused on operational issues that give us little chance to raise our heads above the parapet and look at the bigger strategic picture. I think that there definitely is a lack of that strategic guidance or visioning" (10); "What is important, is that somebody opens their eyes of where we should be looking at in a generation" (1).

Workshop participants suggested that tourism needed "long term business modelling" (TWBL) and short-termism needed to be overcome (TWBG, CWGS). It was suggested that destinations "Lost the ability to look greater than two years ahead when South West Tourism went" (CWBS), that "There is no longer proactive support for sustainable tourism" (CWOD) and there is "Not a clear remit to drive it locally" (TW6). Such comments could reflect blame shifting by DMOs to avoid taking a lead, as there was no mention of proactive efforts by DMOs to try and fill the gap, despite it being seen as useful: "If the DMOs could provide some strategic leadership in a way that is intelligible, simple and useful for the tourism industry then I think it could be useful" (16).

5.3.2 Roles and regulating responsibility in tourism

Evaluation questionnaires from the workshops revealed that 97% respondents thought tourism had a role to play in reducing carbon emissions with no-one ticking 'no' and only one person (3%) answering 'unsure'. The explanations provided for there being a role demonstrated a strong sense of responsibility, “It goes without saying surely” (TW11) and “It’s a no-brainer, it has to” (CW16). Several responses suggested that all sectors must play a part in reducing emissions and tourism was no exception, but it was identified that “The cross cutting nature of tourism emissions makes it hard to disaggregate from other sectors” (CW4).

Tourism was described as a “large sector with high emissions so it needs to be part of the solution” (TW7). It was suggested that the sector should play an enhanced role in reducing emissions because tourism:

- had considerable economic significance (CW5, CW7, CW17, TW15);
- as an activity was arguably “not a necessity” (TW4);
- was reliant on transport and energy (TW5, CW12, CW20);
- could play a positive role and be a change agent and “force for good” (CW13).

The perception of interviewees was that tourism had a role and responsibility for reducing carbon emissions, but that it was difficult to assign responsibility: “I don’t know… There is no obvious place for that at the moment” (10) and “I am not saying that it is not important in any way. It is a difficult one to answer” (14). Carbon measurement seemed to be the responsibility of all and no-one: “I think it is really everybody’s responsibility” (5), and “I am not convinced that there is a responsibility of any one of those bodies at the moment to do that. It should be a responsibility, but also, well it is not exactly our issue. It is somebody else’s” (8).

Participants did express a desire for the “who” (TWCB) and “how” (TWGG, TWRG) to be determined in terms of accountability and responsibility for measuring, co-ordinating and disseminating carbon data. This was explored further in the interviews which identified a national responsibility, with mention of the government (1, 2, 3, 7, 8), the English Tourist Board (3, 8, 9, 14, 15, 16) and national industry bodies and associations (8, 9): “Government initially I think” (7); “It would be best placed if government were going to take more of an active role because with the legislator targets around carbon reduction they have a vested interest" (2); "I think it is an opportunity for industry leaders, so you know I suppose VisitEngland is leading tourism on the national scale and also internationally, so it does fit well with them" (14); "Organisations like Tourism Alliance and the British Hospitality Association but unfortunately.... it doesn't sit high up enough in their priorities to emerge as something that they are really going to champion" (8). There was a suggestion that carbon targets should come from VisitEngland and become part of the strategic framework for tourism (15) and it was also suggested that it would be even better coming from a European level (8).

Local government were identified in the interviews as potential agents of responsibility (11, 12, 14, 15, 7, 8, 9) because of their influence over tourism management and DMOs (9). Some interviewees mentioned generic work carried out by local councils to measure and monitor carbon (5, 1, 11, 16). It was also seen to be an area where DMOs had a responsibility, "I guess ultimately, a good destination management organisation would try and find the resource to do that... there are some very mature destinations out there, who are doing this already, because they recognise the value" (4). One interviewee identified that "Cumbria tourism, for example, measured their own carbon impact and footprint in order to benchmark themselves and create a starting point for their future measurement and target setting, but we haven't done that here as far as I am aware" (10).

The industry was also regarded as responsible for a move towards low-carbon tourism, "It should be the responsibility of every individual business in due course" (5). Incentives were alluded to as industry enablers, for example "They must be shown how to do it, make it dead easy and if they are doing it properly they get their incentive" (16). However, regulation and statutory requirements were supported as a means to ensure engagement (8, 9, 15): "If it became legislation then people would have to do it and then everybody would do it" (15); "What we need is to be penalised for being heavily consumptive and incentives for being lightly consumptive. Then you would find no difficulty whatsoever to get every business interested in measuring it. Put in some tax rules, the only way honestly is intervention" (6).

Interestingly, both workshops where industry representatives were included, demonstrated an appetite for carbon legislation and regulation (TWBL, TWBG, TWRG, CWBD, CWGS, CWYS, CWOD, CWRS), with specific mention of a travel related tourism tax (CWGS, CWOD). Linking carbon to taxation was identified as a way to overcome inertia and inaction: "A mechanism is required to make it happen, bureaucracy puts people off but if you have to do it then you get used to it" (TWR). The use of taxes as either an incentive (TWBL, TWRG, CWBD, CWBS) or penalty (TWBG, TWRG, CWGS, CWYS, CWOD, CWRS) for the industry was a common suggestion: "If you can demonstrate that you can reduce your carbon emissions by a significant amount you have tax breaks or rebates based on what you are doing" (16). Carbon credits (TWBG) and personal carbon budgets were identified as an opportunity to motivate and help facilitate low-carbon industry and to change the behaviour of visitors (CWBD, CWRS): "if you want to go on holiday you should have to save carbon credits" (TWBG).

5.3.3 Tourism policy, priorities and plans

A tourism policy shift extending strategic success and tourism priorities beyond 'growth' was a significant theme emerging from the results. Growth and economic benefit consistently featured as primary strategic priorities for tourism, with many DMOs setting targets. For example: "Our strategic priorities and our strategic aims are to grow our visitor economy by 25% in terms of volume of visitors over the next 10 years and to grow the value of the visitor spend by 20% over the next 25 years" (4). One interviewee referred to tourism's "main driver" as the "economic benefit of the tourism sector in terms of the overall economy of the county" (5). Some destinations specified growth in value not volume, identifying a limited capacity for growth in numbers. For example, a "primary focus" for one destination was "high spending overseas visitors" because that was where they identified growth in value as most achievable (10).

Workshop groups discussed the challenge for low-carbon tourism in the current economic climate where the focus was only on tourist numbers and expenditure, with little consideration of impact (TWBG). The discussions suggested that the "focus on growth was unsustainable in terms of CO_2 reduction" (TWCB) and was a key challenge (CWGS, CWYS, CWRG). A few groups suggested carbon needed repositioning in economic terms (CWRS), since tourism was concerned with costs and profit: "What does kg carbon mean in terms of money?" (CWGS). A paradigm shift was suggested (TWBG, CWR) to align economic and low-carbon agendas, with the suggestion of new measures of success, "£ retained in the local economy per kg/CO_2" (CWBS). Tourism policies would need to shift, for example, "Home grown tourism" (CWGS) was suggested and might be stimulated if consumers were made accountable through carbon pricing of products (CWBG).

A reason suggested for inactivity was the recession, the "current economic crisis is eclipsing the carbon crisis" (CWR). "Everyone is struggling" (TWRG) and it is "lost in the noise of other pressures" (CWOD). The interviewees also identified the economic downturn as a reason why sustainability and related issues such as carbon mitigation were not really being considered: "I think you know sadly it has been a real victim of the recession, it is rightly or wrongly seen I think as kind of nice to have, rather than a helpful way of developing growth... I think that from any organisation, growth is the key priority and there is perhaps less of a focus on the impact of that growth" (13). However, some interviewees identified an emerging opportunity to look for "added value as opposed to pure economic value" and to "go green" (16). It was suggested that customers were starting to expect it now (9) and some respondents identified that as a selling point, suggesting that financial and marketing benefits existed. Lower-carbon activities could reduce costs to the consumer and increase business profitability and that was identified as an opportunity to help tourism to stay in business (TWBL, CWBD, CWBS, CWGS, CWRS, CWRS).

The general perception of interviewees was that sustainability and carbon mitigation did not really feature in destination management because they were not high enough priorities, even though they were recognised as important issues (2, 4, 9, 12, 13). It was described as "nice to do" (4) but more resources needed to be available, as board members did not want to spend existing budgets on it (2, 4, 7, 13). This was reflected at the national level, where capacity and prioritisation challenges were identified as primary reasons for limited action and responsibility for sustainability was passed onto the National Tourist Boards. Commenting about getting environmental sustainability onto the national tourism policy agenda: "I put it in, but if it stays in, that is a different question... a lesser priority now than it was before" (2). The majority of destination managers interviewed reinforced the sentiment that sustainability did not seem to be on the national agenda. For example: "We don't have South West Tourism any more as the lead organisation pushing sustainable tourism, because that was what they were really going for and it doesn't seem to be the same case for VisitEngland" (12).

For most interviewees, the broader issue of sustainability did not feature as a priority. It was emerging or, for a few, a part of what they already did. It was referred to as a "cross-cutting theme" (4) or "a consideration" (15) rather than a specific priority. One interviewee said "it was an issue and it is something we keep an eye on..." (13). Sustainability seems to have slipped off the agenda: "It seems a couple of years ago that sustainability and tourism was the sexy thing, probably about three or four years ago. But it doesn't seem to be that case anymore" (12). For those destinations where sustainability did feature as a strategic priority, it was usually linked to an environmental status/award, or where a protected natural environment formed a significant aspect of the destination (16, 7).

For example, one interviewee worked in a destination with World Heritage Site status, where a mandate existed to protect, preserve and present the site as the primary priority. Management under this model was based on the World Heritage Convention and integrated within communities. The mandate included promoting awareness and understanding of the site so it could be maintained in good condition for the future: "If you look at our plan we talk about visitor management; we don't talk about tourism" (16). This approach to destination management prioritised long-term protection of the destination over growth in economic value and volume. One interviewee suggested that strategic direction should be broadened to be more about "quality and sustainability and not quantity" (1).

In terms of policy and strategic direction, the workshops revealed a desire to increase the content on environmental sustainability and for low-carbon to be higher on the agenda and incorporated into policy and plans: "I expect to see a massive increase in the amount of green and sustainable initiatives and it has got to be much, much, higher on our agenda in the future" (7); "It is actually getting across that this isn't going to go away and that it is not that complicated" (9). The most frequent connection was made to transport, reducing congestion and car use. Mitigating the impact of transport and in particular, air travel, was identified as a fundamental challenge for low-carbon tourism (and vice versa) (CWBS, CWYS, CWOD, CWRS). This seemed to lead to questioning of the rationale behind the focus on overseas visitors (CWGS, CWOD, CWBS), although it was recognised that displacing overseas visitors might not reduce global emissions (TWRG).

Participants identified the need for tourism and transport policy and practice to be co-ordinated (CWGS, CWYS), to “reduce travel and assist in modal change to low-carbon” (CWBS). Carbon labelling of tourism products and packages was also suggested as a mechanism to facilitate accountability and low-carbon decision-making (TWBG, CWBS), demonstrate impact and transparency (TWRG), and promote consumer choice and industry competition (TWRG). For example, a suggestion was to model the “carbon impact of going overseas versus a UK Cornish break” (CWBS). Air travel emerged as a particular problem. The macro challenge of the carbon consequences of aviation and making the emissions impact transparent “would be a real hornet’s nest” and was described as a “double edged sword” (13). On the one hand measuring and managing impact could discourage flying abroad and promote holidays at home, which would be beneficial, but could create an immediate problem for inbound passengers.

Despite identifying an opportunity to incorporate carbon mitigation into tourism policy and plans, several participants referred to it as a ‘future’ issue: “It is primarily unquestionable at the moment and nobody is talking about it, but it seems to me inevitable that people will have to measure their carbon in the very near future” (6). Another interviewee made reference to the challenges of delivery: “I don’t think there is a great deal of problem integrating it into a strategy. I think there is a much greater problem in making the strategy a reality” (11).

5.3.4 Demonstrating business benefit and relevance

The inherent link between tourism, travel and carbon reduction was recognised but seen as a dilemma in terms of action: “It’s difficult because we are an economy that is based on people coming into the region so they are by very nature burning carbon to get here” (6) and “I suppose the biggest challenge is how you balance the issue of travelling somewhere that in most cases is going to have a damaging effect” (8). Tensions appeared to arise from a lack of attention to the links between emissions growth and travel: “it is not formalised in our strategy... just because we are mainly marketing to potential visitors, and I suppose they are generally coming by car or some form of transport that probably isn’t as sustainable as it could be” (14).

The workshops identified low-carbon inertia and inactivity, suggesting there was “Talk but not so much action” (CWBS), “Too much lip service and no delivery” (CWGS) and “Cognitive dissonance” was highlighted as a challenge (CWRS). Approximately half of the interviewees (1, 6, 8, 9, 12, 14) felt that a contradiction existed because tourism management encouraged and promoted travel and the private use of transport. There “will always be a contradiction with tourism... encouraging people to leave areas to travel, to stay for a short while and then go back” (9) and “Tourism is just not going to help reduce carbon emissions. It is going to do the opposite” (8).

Equally, around half the interviewees advocated that tourism management and carbon reduction were complementary (4, 5, 7, 10, 11, 15) and that a strategic approach should be taken to manage the impact of tourism (5): “Carbon reduction should be a consequence of good tourism management” (10). One interviewee commented that: “The population is growing and you know as visitor numbers grow you are automatically going to get a knock on effect, so it is going to be increasingly important to try and mitigate that” (4). Competitive opportunities associated with addressing emissions were also identified: “I think that one can only be helped by the measurement of carbon, if you are able to say the way we are looking after tourism is friendlier to the environment than the average” (8).

Developing the tourism sector’s role in carbon mitigation appeared to be linked to the benefit provided, the relative worth, importance and usefulness: “So, should we have a role? Yes, we should. Do we have a role at the moment? Not really, and that is just down to the understanding of where its value is" (2). A number of interviewees suggested that emissions reduction should be a core part of tourism's 'value proposition': "Industry should be concerned about the triple bottom line and how they achieve that. You know, what is good for their businesses are ultimately good for profit" (11). A suggested strategy to get the sector on board, was to link it to economic value, quality and price: "That is how you need to do it, on cost and value" (13); "What I mean by increasing the value is local purchasing and supply chains, local energy production, making more of the benefit locally and sustainable growth (1)".

Findings from the interviews suggested that the low-carbon agenda and associated communications did not demonstrate 'added value', nor make the links to economic efficiency and the business benefits, described as an opportunity and an enabler: "This is not about tree hugging; this is about making a business more efficient so that you save money, you burn less carbon, you are more efficient and your customers will like you for doing that. To me it is a complete no brainer" (6). This suggested the intrinsic links between the sector's economic resilience and the low-carbon agenda needed to be strengthened and highlighted. As one interviewee stated, "I think one of the last points you picked up on could be the way forward, linking the benefits of low-carbon with economic benefits. This is because the economic rejuvenation driving the economy is at the top of every destination's agenda, with job protection and creation the number one priority. So it is how you embed it into that area" (15).

5.3.5 Managing destinations for low-carbon tourism

For South West destinations there were different management models in place and an apparent trend toward public/private arm's length partnerships or companies extending funding beyond public to private sector funds (4, 7, 12, 14, 15). Some DMOs were primarily public sector managed and responsibility was based in or linked to the economic section (5) or economic portfolio of the Council (11). An observation from the interviews was that the responses from those working with private-led DMOs were primarily business development and promotion-orientated, and were less concerned with the management of the destination for tourism than those led by the public sector. The arms length approach of private-led or public-private sector DMOs appeared to distance them from the public realm and destination 'management' activities which continued but remained the responsibility of the Council or other partnerships (15). A challenge identified by one interviewee was that the local authority did not provide strategic direction for tourism in the area: "… because the policy is for the private sector to do that themselves" (5).

It appeared that responsibility for 'management' of tourism in destinations required clarity, and that current models and practice of DMOs were insufficient to support carbon mitigation efforts: "The biggest challenge is the fact that there is no longer a relatively neat model of what a destination management organisation is, or could, or should be. To me that is the biggest challenge and that has to be addressed first before you look at what the challenges around carbon management are for that organisation" (5). Interviewees suggested that the theoretical role of DMOs was confused and as one interviewee said: "Destination management is a process, a concept and a philosophy, rather than an organisation. It has become an organisational issue rather than a 'hearts and minds' issue" (1).

Suggestions were that DMOs should have a role in mitigating tourism's carbon footprint, "We are the platform or the vehicle that communicates with the industry so I think we do have a role" (15). This was supported from a national viewpoint, "I think they can play a real leading role in reducing carbon emissions and they should" (2). Interviewees struggled with questions on this topic, and alluded to problems and challenges, starting with responses like: "That is a big question" (12), "It is a dilemma" (6), and "So difficult isn't it?" (9). Integrating low-carbon into the operating model was suggested as a response: “The only frustration I still have is that I think there is still a misunderstanding about where this sits within the whole operating model for a business or for a destination…. it is that combination of economic and environmental viability for the future.... not one or the other.... I think in truth it has to be properly integrated” (8).

Both the workshop and interview results suggested that stakeholders acknowledged that carbon mitigation was an issue for tourism, so it could be timely to reposition carbon reduction as part of the strategic tourism agenda: “It is something we should be refreshing our views on and it is something that we should be doing” (9). Two interviewees indicated that they planned to incorporate carbon mitigation into future destination management plans when they came up for review (1, 7). The reasoning was described by one interviewee as twofold, “Partly the change in the role of the tourist board, because before I arrived it was just marketing and nothing to do with anything else, and secondly, the principles of low carbon, green, sustainable, resilient, have come through as issues that were not necessarily on peoples’ agendas before” (1).

Some tourism stakeholders did not know where to start or what their role should be: “I want to make sure that we maintain a real positive relationship with all our members, and that they all willingly move towards carbon measurement... but I am not sure how to do it at this moment in time” (7). Respondents appeared disempowered and in some instances, frustrated by their inability to effect change: “There is a whole host of challenges” (11) and “If we had much more influence on decisions and planning... it would probably be something we would feed in and try to get further up the agenda” (9). Destination managers appeared despondent and unwilling to act or speak out, “We influence things but we don’t get to the nitty gritty of actually saying this is not sustainable; this is not clever carbon wise; we are just gently encouraging in the background really... pretty powerless really” (9).

It seemed that DMOs could provide strategic leadership and have influence with the industry and that Destination Managers were carbon conscious. However, this consciousness was not translating into improved carbon monitoring and management. Despite Destination Managers questioning the sector's present orientations, they conformed to the status-quo: "They all work to a similar kind of formula in the way that they ask questions and the way they analyse data. So we are not going to try and change any of that because if we do, we are just mavericks on the outside" (6). There appeared to be concern about promoting the agenda too much (a personal ethical trade-off), that members were not on board and it could jeopardise their job position: "There are interestingly quite a lot of people who think I am a bit crazy for doing it you know, and it is a difficult one for me to maintain my integrity as the Chief Executive" (7).

The role of DMOs was predominantly described by respondents as marketing, promotion and growth. Some specifically referred to their DMOs as a "marketing organisation" (9, 10, 15) with a remit to promote the area as a visitor destination and to expand the visitor economy: "We act as a destination management organisation ensuring that we encourage visitors to come and visit and spend money and we grow the visitor economy both in terms of volume of visitors as well as the value in economic growth terms" (4). The predominant focus on marketing was also reflected from a national perspective on the role of DMOs: "I would say all of them without exception do promotion. I don't think any of them really do marketing because none of them, very few of them, have any ability to control the product or the price, so they really only do the promotional side of marketing. I would say out of the 200 something organisations there are probably only about 45 that do destination management in its truest sense" (2).

One interviewee revealed frustration about national tourism marketing objectives: "If I hear one more person say 'what are we going to do about the Chinese market'

I am going to go ballistic. You have the government saying you have to go after the BRIC countries, and you go why? We have domestic and European markets on our doorstep?" (1). Part of the challenge appeared to be that successful destinations and businesses were associated with high numbers of overseas visitors. This compounds neglect as low-carbon tourism becomes an increasing challenge and contradiction (2, 4, 14, 16), but as one interviewee pointed out, "It doesn't have to be" (16). Tourism management could embrace the opportunities: "I think people will always want to go places if they can afford to. That is a fact, that is a given. Therefore you have to look at making the destination and the functioning within that destination as sustainable as possible" (16). Marketing was also identified as a management activity which could facilitate a low-carbon tourism economy and an area where DMOs heavily invested and could influence (TWGG, TWBL, CWBG, CWOD, CWRS).

A low-carbon destination was seen to protect and preserve a quality environment (CWGS) and provide "better long term future sustainability" for tourism. It was also described as a unique selling point, attractive to visitors and enhancing reputation (CWYS, CWRS) and "makes customers feel better" (CWBS). Partnerships, tourism networks and collaborative approaches emerged as mechanisms for progressing the low-carbon agenda (TWRG, CWBS, CWGS). Suggestions included cooperative [55] selling and purchasing, cluster working [56] and the Transition

[55] Cooperatives are people centred organisations that are owned, controlled and used by their members to benefit their members and things that matter to them. Members often have a close association with the enterprise as producers or consumers of its products or services. They are based on values of self-help, self responsibility, democracy, equality, equity and solidarity. http://www.uk.coop/

[56] A group of agencies that work together towards common objectives within a particular sector. The 'cluster approach' is a coordination mechanism implemented by the UN to improve humanitarian coordination in response to natural disasters and complex emergencies. http://www.who.int/hac/techguidance/tools/manuals/who_field_handbook/annex_7/en/

Network[57], which could help facilitate change and overcome barriers such as cost and limited capacity (CWBD, TWBG, CWGS).

Leadership and management roles within the realms of the DMO were described in terms of marketing, strategic planning, research and training. Tourism development, infrastructure provision and accountability, were identified as areas which could be influenced but were shared with other services within the local authority (1). This was also the case for economic development, transport planning and waste management. As part of the interviews, the five modelled decarbonisation policies (see section 4.6.4) were discussed to investigate whether DMOs were undertaking these activities. They were all seen to present opportunities and reflect good management practice, in particular those directly related to the quality of the offer, such as locally sourced food and good quality efficient accommodation (13). In most destinations, some activity was underway in one or more of these areas and although they contributed to carbon reduction, were not explicitly recognised as such.

The limited level of DMO influence and control on the industry was raised as an issue: "I think we need to be realistic to what a tourism strategy for [destination name] can achieve with individual businesses without legislative powers" (11). Referring to the DMO, one interviewee commented: "It should be the conductor, not the orchestra. The DMO can never deliver full destination management; it is not within their gift or their remit" (1).

5.3.6 Resources, practical support and incentives

It is important to note the funding and structural changes which have impacted on the regional tourism landscape and capacity of DMOs across England (Dinan,

[57] "The Transition Network is a charitable organisation whose role is to inspire, encourage, connect, support and train communities as they self-organise around the Transition model, creating initiatives that rebuild resilience and reduce CO_2 emissions". https://www.transitionnetwork.org/about

Hutchison and Coles, 2011). Government resources for tourism in terms of finances and expertise were drastically reduced with the demise of the Regional Development Agencies (RDAs), which funded regional tourism activity. For the South West, this led to the closure of the regional tourist board ‘South West Tourism’ in March 2011. South West Tourism provided strategic direction and planning, undertook research for DMOs, delivered training and skills development courses, undertook regional marketing campaigns and initiatives, promoted and endorsed national quality standards, delivered the tourism excellence awards, and provided practical advice and tools in the areas of sustainable tourism and carbon management.

Participants in the interviews indicated that these changes have had a negative impact in terms of resources and expertise for the sustainable tourism and low-carbon agendas: “With the demise of the RDAs in particular, you know there were a lot of really good people who had a lot of interest in this area... if you take all of that out, then you are left with destinations, local authorities and tourist boards with less resource than they had a few years ago” (3). Concern was also expressed that tourism governance structures had “become increasingly more fragmented” (4) and reduced funding and capacity were identified as key challenges: “There are no resources to do three quarters of the aspirations” (CWGS, 6). This had implications for the form and function of the sub-regional tourism support bodies remaining, such as Destination Management Organisations (DMOs) and Area Tourism Partnerships. For example: “All the funding structures have changed and some district councils actually provide no strategic or financial support to tourism” (5). One respondent suggested that “The principles of planning have gone out of the window in that planning is about how do we manage with less money” (1). There were suggestions of “better co-ordination” of public funds if low-carbon tourism initiatives were to be integrated (CWGS), especially as the approach to carbon mitigation was also fragmented (CWRG).

All the workshop groups identified the need for resources and incentives to enable destinations and the sector to interpret, invest and engage in the low-carbon agenda. The results suggested that there was “no money for it” and “investment in the wrong avenues” hindered carbon reduction (CWGS). Suggestions for practical support and resources included a website tool to calculate and compare carbon footprints and visual interpretations of carbon impact (TWRG), together with “Fun and inventive ways of achieving change” (CWBS). More formal and prescriptive mechanisms were proposed, for example introducing carbon monitoring requirements (CWRG), linking carbon impact to grading and star ratings (CWGS), and embedding into accreditation and Environmental Management Systems (CWYS, CWOD, CWRG). There was support for carbon to be linked to financial accounting processes and business rates (CWBS, CWGS, CWYS), with a “rebate if they do effective carbon measurement and management” (CWBS, CWOD).

The interviews also identified limited resources (time, budget and staffing) and costs as prominent themes (1, 3, 4, 5, 7, 9, 10, 12), which seemed to be linked to the low level of priority assigned to carbon (2, 4, 7, 9, 10, 12, 13). For example: “The barrier will be cost. I mean everything has a price to it and every day we are having to make decisions about priorities” (10) and “Unless some of our board members held their hands up and said it is a major priority for me so therefore I want you to use part of my money on doing that, then I think we would struggle to actually get the resource to do it” (4).

Group initiatives and incentives promoting collective tourism action were suggested, such as incorporating low-carbon into tourism awards (TWBL, CWGS, CWRS), recognising achievements and promoting the ‘peer to peer’ effect (CWYS).

It was thought to be important to inspire the early adopters (CWR), to identify and promote ambassadors (CWYS) and promote best practice and improvement (TWGG, CWBD, CWRS). Participants suggested that businesses should be collating data and that should form part of star grading systems and green accreditation schemes to help avoid purely symbolic actions and to prevent hypocrisy (TWBG, CWGS). In addition, the need for a collaborative and collective effort and network approach was identified (CWGS, CWRS).

Stakeholders requested "solutions" and practical examples, through case studies (TWBG, CWBD, CWYS) and guidelines in terms of 'milestones', 'priorities', 'quick wins' and 'top 5 actions', in order to help destinations focus (CWBD, CWYS, CWRS). The Health Service approach of 10,000 steps a day was suggested (CWBS). Over half of the workshop groups felt that the data should be used to influence and prioritise destination marketing, for example, to target closer markets and to increase length of stay (TWGG, TWBL, CWBS, CWGS, CWOD), and to change consumer behaviour and promote greener holidays (TWGG, TWBG, CWBD, CWGS, CWRS).

5.3.7 Consistent and standardised carbon measurement

The lack of carbon accounting in or by destinations did not appear to be due to deficient interest in the issue. Responses suggested that destination managers could see a use for it but had not had access to carbon data: "It is never really anything that we have had access to so I wouldn't like to say how much benefit it would be to us... I certainly think it would be interesting and it could potentially help us work more sustainable thinking into our marketing plan" (14). Access to the data seemed to be a fundamental prerequisite to increasing understanding and getting it on the agenda: "The initial challenge is always understanding where you are currently... and it is only once you understand that, that you can then understand how you need to change" (4).

Interview responses suggested that tourism performance indicators signify what gets managed and where performance is deemed important, “You only manage what you measure” (1) and “I think measures are absolutely important in terms of managing and understanding our performance and what is changing.... obviously if we are having to report on it, then people become more attuned to what it is they need to do” (2). Tourism performance indicators used by DMOs were often linked to national tourism data sets, measures of success and reporting models. Indicators were currently used for periodic reporting, for example to the board and/or Council (1, 3, 5, 9, 8, 10, 12, 13, 14) to compare and communicate performance to the industry, to inform strategy and for funded projects (2, 4, 5, 7, 15).

Current performance measures were seen to be historic in nature (1) and the economic benefits of the sector were the main driver, “used as a number one indicator of the importance of tourism to the county” (5). It is evident from the results that volume and value indicators dominated, with a focus on visitor numbers/nights and expenditure, and that it was rare to report on environmental impact measures including carbon (1, 2, 4, 5, 6, 7, 9, 10, 12, 13, 15). When asked about whether there were particular measures around sustainability, the majority answered negatively, or were unsure or thought someone else was dealing with it: “I think they do measure, or have some sort of monitoring of sustainability within the council” (14). Lack of resources (16) and priority were identified as reasons: “I think it is seen as a consideration here, but it is not considered as a priority” (15);. Some interviewees alluded to future possibilities, for example it “is not within the data set we are collecting at the moment but will be in the future” (7).

Understanding of carbon measurement in tourism and for destinations was limited: “I don’t fully understand what the measures might be or how they might best be used, and there is no common currency around a measure for carbon, or a measure for impacts from visitors" (10). Carbon measurement was described as complex and challenging (2) and needed to engage destinations and their members in reliable and consistent measurement (16). Respondents suggested it would be worth the investment if there was a useful output (16) and easy process: "Let's make it simple, let's make it so that everybody can understand how we are going to measure this and what it is all about, because if we don't make it clear, then we will definitely leave people behind" (7); "I think you almost need to make it the norm as something that you fill in as something that you do" (9).

Interviewees suggested that carbon measurement should be linked to VisitEngland's national performance measures and existing performance management regime, to ensure a standardised approach for consistent and comparable data: "Unless the data can be compared to other regions and their performance it is not necessarily very useful" (6). This also provided the opportunity to raise carbon mitigation as a higher priority in tourism:

"A good starting point would be to get a measure out and have it become part of the tourism management vocabulary in the way that we understand IPS or occupancy percentages" (10)

"You have to do it in a language that people in the tourism sector speak. So you know, it is related to arrivals in this way, or inbound visitors in this way, or related to an index of tourism activity within an area of tourism output" (3)

One interviewee suggested that "If those connections can be made then clearly there will be a better understanding and a desire to use them" (2). A number of interviewees also suggested, and the majority supported, the notion of integrating economic and carbon measurement (such as eco-efficiency): "Obsession by the government that it is all about the economy and jobs... it can be the economy, jobs and low carbon, but they don't tend to put the three together... What you need for [destination name] is an integrated holistic approach because it tends to be all about jobs and economy" (1).

Measuring tourism's emissions was helpful provided the approach was consistent and fair across all sectors: "I think that measuring carbon is inherently useful across industry in general" (11). However, caution was raised about singling out tourism: "When we are talking about places or destinations having carbon targets, it is the whole of the place, not just the tourism businesses that operate within that place... if it is an holistic approach, and this is what we are saying to all industry then it is far more likely to be if not welcomed, understood that this is what we need to do" (11). Caution was expressed about focussing on carbon to the detriment of other measures, "You have to be very careful that you get a raft of measures" (1).

There was a mixed response about who should take responsibility for carbon measurement: "It is not for me or [DMO NAME] to be the organisation that measures the carbon impact" (10). Participants suggested that national standards (2) and a consistent "endorsed system" would be required to provide integrity and enable the ability to benchmark (1, 2, 5, TWGG, CWBD, CWRG): "I think it could be helpful as long as it is reliable and even. I suppose what you wouldn't want is a system that was different in different areas... If we can have information that makes you realise that place X is really outperforming you because they are doing things differently, that is a real spur for people" (8). An independent approach was mentioned as an option, to avoid industry and "political interference" and it was suggested that measurement could be "built into academic work, because everybody else can be compromised" (1). Acorn T-STATS (an online database for destinations) was also mentioned as a mechanism bringing together a range of metrics in one place to help destinations "understand the different dynamics" (10).

The Tourism Intelligence Unit (TIU), which leads on tourism statistics nationally, published a report reviewing sustainable tourism indicators (ONS, 2011), but did not appear to have developed this further. Carbon footprinting did feature in the report, with an example to measure the CO_2 emissions by tourism industries and reference was also made to the REAP Tourism footprinting tool. Work has also been carried out by the European Tourism Intelligence Partnership and the University of Surrey, to develop and roll out a European set of indicators on sustainable tourism (European Commission, 2013). Greenhouse gas emissions, as a specific measure, did not feature as an indicator in the European Tourism Indicators System (ETIS), although it did include as a core indicator, the proportion of tourism enterprises in a destination involved in climate change mitigation schemes (European Commission, 2013).

From a national perspective, it was suggested that there was an appetite to measure environmental impact: “An area that we always wanted to try and develop at a macro scale at least, was to combine the current environmental accounts with the tourism satellite accounts, but this is driven to some extent by what sponsors want as well, and it doesn’t appear to be that high on the agenda” (3). The modelling undertaken in this research and in other studies (section 2.4.4, Table 2.4) demonstrates that methodologies exist to measure the carbon footprint of tourism, so this should not be a constraint. The challenge appears to be the level of priority it is given.

5.3.8 Improving carbon literacy and low-carbon communications

How carbon mitigation could be communicated to the tourism sector came up as a consistent theme in the workshops, with suggestions that clear jargon-free communications were required, that provide best practice examples, highlight the benefits (commercial and cost primarily), and demonstrate why tourism should take the low-carbon agenda seriously. A positive reframing of low-carbon was proposed, to demonstrate the ‘win-win’ aspect of engaging in the low-carbon agenda (TWGG, CWYS), the “How to do things, not how not to” (CWBD). Participants felt that tourism communications needed to demonstrate the economic benefits (TWBG), enhanced resilience (TWBL) and improved destination image and reputation of reducing carbon (TWRG). As section 5.3.4 revealed, the business case has to be set out (TWBL) and the "value has to be demonstrated" (TWCB).

In terms of integrating carbon into tourism management, training and capacity building was identified as a need (CWBS, CWRS), reflecting concerns about "lack of expertise" (TWBL) and the need to improve carbon literacy (CWRS). A recurring theme was to improve education as low-carbon tourism was "not on the radar" or communicated effectively (TWRG). Participants in the workshops suggested that communication campaigns were needed which were inspirational (CWBD), relevant for destinations (CWYS), and consistent with "coordination of public bodies promoting the same message" (TWGG). An identified challenge was that carbon measurement and management were complex issues needing simplification, if businesses and DMOs were to be engaged with and act upon them (CWBS). Although the evaluation questionnaire results suggested that 79% of the workshop participants had a medium to very high knowledge of national carbon reduction targets (see Figure 5.2), it was apparent from the workshops that few had considered the relevance and implications of carbon mitigation for tourism and travel. It was suggested that the carbon footprint for tourism should be made available: "Publicise the data and implications much more widely" (CWOD).

Improved marketing and communications targeting businesses (and in turn visitors) also emerged as a theme. This had the potential to play a key role in facilitating a move to a low-carbon economy, if the messages were clear, considered and consistent: "We must actually find ways of communicating the message to our members very clearly. Now whether or not they will actually listen to us is going to be quite interesting, I think it will be a combination of many different organisations that will influence their decisions to go forward" (7). One interviewee suggested that the interview had helped bring the issue to the fore: "Raising those issues with us helps because it just reminds us that this is an issue that we need to be tackling.

You are doing enough just by talking to me; we haven't actually done anything yet; we need to do something, and we need to bring it back into the agenda" (9). VisitEngland was identified as a key agent for communications on low-carbon tourism (TWGG).

5.4 Chapter Summary

The qualitative research demonstrated that carbon footprint data was an effective tool to engage tourism stakeholders in discussion and debate around a transition to a low-carbon tourism economy. The data provided evidence and direction, was important for management and could mobilise action and change. Stakeholder dialogue and debate emerged as a valuable consideration regarding potential effectiveness. The qualitative research findings (across all three methods) demonstrated that an appetite exists at all levels (local, regional and national) to improve measurement of tourism's carbon footprint.

This chapter also examined tourism stakeholder perceptions of the opportunities and challenges for transition to a low-carbon tourism economy. Table 5.1 summarises these findings, structured by the eight major themes and their thematic sub categories. Each theme incorporates the associated challenges which have been positively reframed in the context of an opportunity to provide a framework for enabling change.

These qualitative results, alongside the quantitative data from Chapter 4 will be discussed further in the next chapter, which discusses and contextualises the findings in relation to the three research questions.

Table 5.1: Thematic categorisation of the low-carbon tourism opportunities

1.Providing government leadership and direction	**Political engagement**: to ensure low-carbon tourism is on the agenda and to support and facilitate policies and mechanisms **National government leadership**: to provide vision, direction and guidance for low-carbon tourism activity to DMOs, industry and visitors. **Long term planning**: to overcome political and industry short-termism and to future proof the industry and its management **Integrated approach**: to align government policy objectives (e.g. tourism, transport, climate) **Review tourism priorities**: to incorporate the low-carbon agenda and review growth types and targets, in particular the focus on overseas visitors
2.Defining roles and regulating responsibility in tourism	**Accountability**: to acknowledge and define the sector's responsibility and promote answerability **Transparency: to** demonstrate the carbon impact of tourism products and packages to inform consumer choice **Legislation and regulation**: to curb tourism emissions through taxes and rebates, carbon credits and budgets. Incentivise good behavior and penalise bad behavior **Role and responsibility:** should be defined relating to and acknowledging other sectors
3. Redefining tourism policy, priorities and plans	**Address carbon despondency**: and contradictions of the present tourism paradigm **Develop complementarities:** growth needn't be at odds with emission reduction goals **New 'eco-nomic' paradigm**: need to align the economic and carbon agenda so that growth/success equates to reduced CO_2e **Align tourism and transport policy and planning**: to facilitate co-ordinated planning and practice to promote low-carbon solutions and mitigate the impact of travel **Institutionalise low-carbon**: to embed into mainstream policy, plans and processes
4. Demonstrating the benefit and relevance	**Value realignment:** demonstrate the business case, how low-carbon is economically and socially beneficial (address cognitive dissonance and align to business priorities) **Opportunities and challenges**: should be clarified for DMOs to facilitate engagement **Positive 'win win' messages**: to demonstrate efficiency and resilience (e.g. energy prices, carbon costs, future markets), enhanced image, savings and consumer choice **Management**: to inform practice, and influence destination product and marketing activities
5. Managing destinations for low-carbon tourism	**Appetite exists:** to improve carbon measurement and management in destinations **Facilitate and integrate:** corporate and area based CO_2e reduction into destination management activities where DMOs have influence and control **Partnerships**: for a collective approach, networking and collaboration to facilitate change **Utilise marketing**: to promote and develop low-carbon products, travel and tourists **Data capture**: to increase knowledge and inform management of low-carbon destinations
6. Providing resources, incentives and practical support	**Funding and resources**: to enable destinations and the industry to invest and engage **Carbon measurement and management tools:** to support and facilitate action **Mechanisms and rewards**: to facilitate collective tourism action, e.g. initiatives, incentives, ambassadors and low-carbon becoming a feature of tourism awards **Case studies and campaigns**: to provide practical guidance, examples and solutions **Prioritisation**: clarify the primary areas and actions to focus attention and achieve reductions, where destinations have control and influence **Mobilise action**: influence decisions, prioritise investment and promote choice
7. Coordinating standardised carbon measurement for tourism	**Evidence**: to quantify and understand impact to inform decision-making and action **Consistent modelling**: to provide baseline data and enable monitoring of progress, target setting and benchmarking to help inform strategy, policy and interventions **Integrated national approach:** align to current performance measurement systems **Align and expand measures:** develop new eco-efficient and low-carbon indicators **Accessible:** use technology and animation, keep it simple, create online tools
8. Improving carbon literacy and low-carbon communications	**Improve carbon literacy**: to ensure information is clear and accessible, positively framed, innovative, relevant and understandable for destinations, industry and visitors **Increase awareness and understanding**: of the implications of 'not being' low-carbon and promote the importance and ramifications for the tourism and travel industry **Education and training**: to enhance skills and decision-making confidence **Marketing and branding**: to drive and promote carbon reduction through campaigns and consumer information, visual and inspirational **Inertia and inactivity:** needs to be addressed as tourism is 'carbon vulnerable' **Interpretation:** promote meaning, inform behaviour change and broaden knowledge

6 Discussion

6.1 Introduction

This chapter brings together the quantitative and qualitative findings, and explores the implications for tourism destinations moving toward a low-carbon system, conceptually and practically. Whether there is sufficient evidence and if the research corroborates, extends or conflicts with previous studies is also explored.

The discussion is split into three main sections corresponding to the three research questions. The first section (6.2) discusses the role of the carbon footprint indicator as a pre-requisite for carbon management in tourism destinations, alongside the need for standardisation and combined economic and carbon accounting. The second section (6.3) considers the key strategic opportunities for destinations to move towards a low-carbon tourism system. This section explores why, who and what needs to change and is structured by Ancona et al.'s (2004) three lenses of governance: culture, politics and structure. The third section (6.4) examines how the strategic opportunities can be enabled and a conceptual low-carbon transition framework is proposed. Section 6.5 summarises the chapter.

6.2 Measurement as a Prerequisite for Carbon Mitigation

A key finding from the results was that stakeholders perceived the carbon footprint data and measurement of emissions to be important and beneficial. It created focus, direction and increased awareness of tourism's intrinsic relationship with carbon. The carbon modelling challenged beliefs and demonstrated opportunities and alternative pathways to reduce tourism emissions in destinations. However, the chances of moving towards low-carbon destinations appeared to be restricted by the absence of consistent carbon measurement and emissions reduction targets, as a vehicle for creating accountability and demonstrating salience[58]. These findings will be discussed further, along with opportunities for new tourism performance indicators combining economic and low-carbon objectives.

6.2.1 REAP Tourism Modelling

As part of the Literature Review (Chapter 2) a range of tourism emissions studies were reviewed and this research appeared to be the first to apply a consistent footprinting methodology across destinations in a region. The approach enabled a comparative study of destination visitor carbon footprints, illustrating variations in terms of destination footprint size and composition. The footprint differences reflect variances in visitor types and consumption choices on travel, accommodation, sustenance, activities, shopping and length of stay - a finding supported by Gössling et al. (2010).

The UNWTO, UNEP and WMO (2008) global tourism footprint study combined international and domestic tourists and considered three main sub-sectors world-wide: activities, accommodation and transport (air, car, other). The REAP Tourism modelling recognised three further categories of critical tourist consumption: food, shopping, and a category for tourist services.

The six REAP Tourism categories were further broken down into more detailed sub-categories to inform strategic action at the destination level. Specifically food, rarely included in tourism emissions studies (with the exception of Gössling, Garrod, Aall, Hille and Peeters, 2011; Liu, Feng and Yang, 2011) yet it had the highest area of impact for domestic (36%) and day visitors (57%). Shopping had also rarely been considered in tourism footprinting (with the exception of Liu, Feng and Yang, 2011), but was also identified as a major source of emissions, comprising 17% of the emissions for an average day visitor. The absence of food,

[58] Salience is an important concept in political science, used to designate the importance of issues, and the degree to which issues are a problem (Wlezien, 2005)

shopping and tourist services in many studies, suggested the full carbon impact of tourism had been considerably underestimated.

The REAP Tourism breakdown of the footprint results into overseas, domestic and day visitors also revealed critical information for strategic planning. For example, there was a 75% difference in impact between the average South West domestic and overseas staying visitor and only 2.8% between domestic and day visitors. The breakdown of the footprint sectors into further sub-categories demonstrated that although the most significant cause of emissions for overseas visitors was travel to/from the destination (82%), it was particularly high because of the use and impact of international planes (99.4%). This corroborated research findings identifying the need to reduce distance travelled and avoid aviation travel if emissions in tourism were to be reduced (Olsthoorn, 2001; Becken, 2002; Peeters and Dubois, 2010; Scott et al., 2010; Gössling, 2013).

The domestic staying visitor travel (33%) and day visitor travel (12%) footprints were comparatively low, as the footprint size was a consequence of the number of km travelled as well as the carbon impact per km (conversion factor) associated with each transport mode. Transport was clearly the focus for reducing the overseas visitor footprint, but this research showed it not to be the primary cause of emissions for domestic or day visitor footprints. This was contrary to the findings of other studies (Becken, Simmons and Frampton, 2003a; Dwyer et al., 2010; Gössling, 2002), but was primarily linked to the scope of footprint studies and whether indirect emissions were included.

For all visitor types, travel to/from the destination (as opposed to within) was the predominant cause of emissions associated with transport, suggesting that sustainable travel policy, activity and campaigns, should target initiatives and incentives to facilitate behaviour change in this area. The interview findings suggested that current sustainable tourism transport initiatives tended to focus on 'within' destination travel, such as *car free* days or trips and incentives to *give the car a break* once visitors arrived. This highlighted a need for transport planning to be an integral component of tourism and destination planning and management at both local and national levels.

The quantitative REAP modelling also demonstrated that there could be considerable variation in the size of visitor's impact between nearby destinations. For example, overseas visitors had a disproportionately high carbon impact but this varied between destinations (150-275kg), reflecting expenditure and consumption patterns. The results also demonstrated that there were significant differences in relative and absolute emissions from different tourist trips, revealing a factor of 30 between the lowest and highest energy intensities of different markets.

This suggested that the approach taken in this study, measuring the carbon footprint of the visitor economy (consumption perspective) rather than the industry's performance per se (production perspective), provided a more complete account of the emissions impact of tourism to inform destination management, whilst recognising both are intertwined (García-Rosell, Haanpää, Kylänen, and Markuksela 2007). This type of representative consumption analysis for destinations can broaden the understanding of the carbon impact of the tourism system, reaching beyond the 'monetary act of purchase' and the 'dualistic framing of economy and culture' (Saraniemi and Kylänen, 2011, P138). The results could also be used to inform consumer decision-making (Miller, 2003) and to respond to a lack of consumer awareness about tourism's impact (Miller et al., 2010). This can be presented in relation to an average residents footprint using the REAP methodology.

The footprint examination of two events (festival and air show) supported this finding. In both examples, the carbon impact of delivering the event itself (operations) was less than 4% of total event emissions. The predominant impact (more than 96%) came from visitors and their associated activities and choices related to attending the events. Liu, Feng and Yang (2011) looked at similar footprint characteristics for Chengdu city in China and found the structure of consumption to have less influence on the growth of emissions than energy intensity, expenditure and industry size. However, the REAP Tourism modelling would suggest that changes in the structure of consumption have considerable impact for specific components of the footprint and for certain visitor types (see sections 4.4 and 4.6.2).

The scenario modelling demonstrated it was possible to significantly reduce emissions associated with tourism through a combination of mitigation strategies (see section 4.6.4) which included alterations to consumption patterns. The results estimated a 37% reduction in CO_2e emissions from the 2006 baseline, exceeding the Government target of 34% reduction by 2020. Overall, the most successful strategies (based on what was modelled) were first to reduce the carbon intensity of businesses and services by 10%, and second, to reduce personal car and plane km by 15%.

Increasing length of stay by one night, reducing the carbon intensity of travel by 10%, and increasing use of local supply chains by 10%, also had considerable impact. This supported the findings from several tourism carbon footprint studies employing scenario planning techniques (UNWTO, UNEP and WMO, 2008; Jones, 2013), but the crucial question of how such strategies and reductions could be facilitated remains. The concluding scenario results showed that ‘business as usual’ in terms of the current ‘economic growth’ regime and the exponential tourism growth target of 3% (VisitEngland, 2011; South West Tourism Alliance, 2011) precluded emission reductions below the 2006 baseline, and restricted contribution towards the UK's legally binding 2020 emission reduction target of 34%.

Although no formal extension or application of the national emissions reduction target had been made to tourism in the UK, nor was there any suggestion that carbon savings should be spread evenly across sectors, extending the 34% reduction target would seem an appropriate exploratory starting point. Missing the 34% target, would not necessarily represent failure in overall emissions reduction. Tourism's role in emissions reduction and the inter-relationship with other sectoral emissions, such as transport, should be unpicked to ensure strategies are effective and national targets met. For example, neither tourists nor tourism feature in the UKs Low Carbon Transition Plan, despite there being a significant section on transport (Crown, 2009a).

6.2.2 Repurposing Growth

What was important to acknowledge from the carbon modelling was that even if the targeted growth of 3% per annum were halved and accompanied by a combination of all five mitigation measures, this would only achieve a 9.7% saving below the 2006 baseline for tourism in the South West. This demonstrated a key challenge for emissions reduction for tourism and could impede progress made in other sectors. There is, therefore, a strong argument that emissions targets and carbon monitoring should be formally extended to include tourism as a sector. Alternative growth strategies alongside behavioural change, technological innovation to reduce carbon intensity, and energy efficiency, would seem necessary for the decarbonisation of the tourism sector. This finding supported those scholars seriously questioning the validity of tourism 'growth' in a sustainable low-carbon society and assertions that systemic restructuring, alongside steady-state or de-growth[59] strategy would be required if serious reductions in tourism emissions were to be achieved (Gössling, Hall, Peeters and Scott, 2010; Gössling, Scott and Hall, 2013; Hall, 2009, 2010).

Criticisms of no-growth and de-growth models suggest there is limited consideration of the drivers and orientations of growth, the challenge of globalisation, and the impact of de-growth on people's quality of life (Van den Bergh, 2011; Martinez-Alier, Pascual, Vivien and Zaccai, 2010; Schwartzman, 2012). It was also suggested that they under-estimate the ability of technological innovation to alter environmental limits, and rely on the liberal ideology of personal lifestyle changes (Van den Bergh, 2011; Martinez-Alier et al., 2010). However, technology has limitations when it comes to solving growth challenges (Huesemann and Huesemann, 2011). The rebound effect could mean consumption and subsequent impact does not necessarily decrease (Zehner, 2012; Van den Bergh, 2011). For example, a reduction in carbon intensity does not equate to a reduction in km travelled, and might provide the justification for increased travel outweighing the carbon saved. Arguably, changes in behaviour and lifestyle would be critical for a low-carbon tourism shift, however, individual quality of life would have the potential to be enhanced – e.g. longer trip lengths, less time and cost spent travelling, healthier people and environment.

It would seem that the challenge should be to address the negativities surrounding no-growth, and raise awareness of the unsustainability and carbon impact of current growth models so they could be revisited. Van den Bergh (2011) suggested a focus on public policy on environmental regulation would be more likely to gain democratic and political support than explicit de-growth strategy. However, Martínez-Alier (2009) argued that sustainable de-growth toward a steady state was

[59] A steady state economy refers to a stabilised or mildly fluctuating consumption of energy and materials, whereas de-growth models advocate for reduced consumption and production (Schneider et al., 2010).

a plausible objective for developed economies, but required a reform of social and financial institutions, and conventional economic accounting. The REAP modelling suggested the required level of carbon reductions would not be achieved unless a no-growth (steady state) strategy were employed, alongside strategies for mitigation.

The steady state economy concept would suggest a need to minimise throughputs and maximise service, and provides a sustainable alternative to the current era of economic growth (Czech, 2013). Research shows that product and service price could inform consumer choice and consumption patterns (Espey and Espey, 2004), suggesting that prices truly reflecting environmental and climate externalities, such as carbon, could reduce consumption and carbon impacts.

The findings from the quantitative analysis supported this assertion and revealed that even if technological innovation and efficiency were assumed (reductions in carbon intensity were modelled), there would be marginal impact on emission reduction because of the market types and the level of growth pursued or being driven by demand. The findings also raised questions around policy and marketing foci on international visitors on carbon and economic grounds. If a transition toward a low-carbon tourism economy were to be achieved, it would appear that the political priorities and indicators associated with tourism success should be reviewed, to consider the carbon intensity and impact of tourism products, services, visitors and associated expenditure (as part of a wider basket of sustainable tourism indicators). The tourism industry and market was not necessarily to blame for current high emissions but played a critical role and could affect significant change if motivated or empowered to do so, and here the role of government could be crucial.

If the characteristics of tourism and tourists changed substantially, strategies maintaining (and in some instances increasing) income to the sector, but which also demonstrated reductions in emissions, would be feasible. The modelling demonstrated that visitors and products had the potential to be high value with low-carbon impact. For example, domestic visitors were shown to have the best eco-efficiency rating, and targeting local and domestic visitors to visit the South West of England instead of overseas, had potential benefits:

- reducing the national tourism deficit (£15 billion) by redirecting spend back into the UK economy;
- increasing tourism expenditure overall (domestic staying visitors spend more per visitor day);
- reducing the carbon impact of total and per capita emissions of the destination visitor economy (domestic visitors have the lowest impact);
- reducing net global emissions from the reduction of overseas flights.

6.2.3 Data availability and standardisation

A key issue arising from the research and underpinning carbon management in tourism was that consistent carbon emissions data were not available for the sector or destinations – in the UK or internationally. The qualitative findings revealed that carbon was rarely measured or recognised as a strategic issue by national bodies (e.g. DCMS and ONS), National Tourism Agencies (e.g. VisitEngland) or DMOs, although the importance and relevance of the agenda was identified. This could be due to a lack of will to utilise existing evidence from research on tourism and carbon emissions within the UK, and the lack of political will and a process to apply carbon data to tourism planning and management (Jones and Munday, 2007; Forum for the Future, 2009; Whittlesea and Owen, 2012; Jones, 2013; Munday et al, 2013). This finding was supported from an Australian context, where very few government tourism agencies reported on their carbon footprint or had mitigation/offset measures (Zeppel and Beaumont, 2012).

The findings from this research suggested the measurement of tourism's carbon footprint should come from a national expert-led approach, as there was not the capacity or skills at the local destination level (especially now regional government bodies no longer exist). VisitEngland were identified as the primary agency to lead this process with Department of Culture, Media and Sport (DCMS) support, with the suggestion that it could be undertaken by an impartial academic partner and/or the Office for National Statistics (ONS). A national top-down input-output methodology would help to promote consistency, demonstrate state leadership and be relatively cost and time effective. This is a common approach used for national level tourism carbon studies (for example: Patterson and McDonald, 2004; Becken and Patterson, 2006; Jackson et al., 2008; Dwyer et al., 2010; Perch-Nielsen et al., 2010; Jones, 2013; Munday et al, 2013).

To date, most carbon footprinting studies for tourism have been primarily national level and rarely broken down to smaller sub-regional or local government levels which coincide with destination management organisations (the case for SW England). The REAP Tourism modelling demonstrated that meso- and micro-level data revealed important destination characteristics that would be lost at the macro scale. This research suggests that unless carbon data is analysed at subregional and local government level, local relevance and specificities could be misunderstood, and DMOs could perform poorly in respect of enabling and promoting action.

Methodologies exist, enabling carbon emissions and economic expenditure/income to be estimated and linked using standardised accounting practice for tourism activities such as Tourism Satellite Accounts (TSAs), and these can be extended to sub-regional destinations (Dwyer et al., 2010; United Nations, 2010a; Munday et al, 2013; Gössling, 2013). A consistent carbon accounting methodology linked to TSAs could provide data for local destinations and, at national level, could be utilised by Government (DCMS) and VisitEngland to monitor success, promote change, and inform policy and planning. The results suggest that a national, if not international, consistent carbon accounting methodology and set of carbon performance indicators should be established for the tourism sector. This finding is supported by Gössling et al. (2005) and more generally for cities by Ramaswami, Chavez, Ewing-Thiel, and Reeve (2011).

The findings are also supported by a United Nations (2010a) report encouraging the development of TSAs and recommending that "national statistical offices, tourism authorities and/or other organisations with direct responsibility for tourism statistics promote the use of national instruments to collect tourism data at the regional and local levels using a common set of definitions" (p76). The report (United Nations, 2010a, p78) also recommended "that linking tourism and sustainability be considered a priority" for performance indicators and macro-accounting: "The core of this macro-approach at national level consists in establishing a more complex type of input/output matrix in which not only the "usual" inputs are considered, but also environment inputs are established in quantity, and output also includes waste, greenhouse gas emissions and other environmentally significant by-products". On a practical level, resources are required to ensure both the environmental accounts and TSAs are developed to a sufficient level of detail to enable integration (United Nations, 2010a). It is also worth noting that travel to and from the destination is often excluded, yet this research and Gössling (2013) have shown that it is a critical component, particularly aviation.

A standard approach would be fundamental because comparability and benchmarking carbon footprints in destinations is practically impossible at present. The literature review identified fundamentally different definitions, scope, units of analysis, and carbon accounting methodologies (see section 2.4.4, Table 2.4). Kolk et al. (2008) suggested that standardised carbon information should be a key element of governance systems and also found that carbon data provided a channel for accountability to stakeholders, could be used for benchmarking, could focus managerial attention and promote certain performance levels. An increase in the availability of carbon data, research and standardised reporting mechanisms, even with the inherent limitations, would provide opportunities to investigate more closely measurement and management responses to climate change (Kolk et al, 2008).

6.2.4 Use of the carbon footprint

Gössling et al. (2010) suggested that tourism actors have an incomplete understanding of the drivers and complexity of emissions growth; not surprising considering the lack of data. Presentation of the REAP Tourism results at the workshops helped stakeholders to consider the absolute and relative carbon impacts of tourism. The carbon footprint was identified as useful for policy, strategic planning and practice to reduce tourism sector emissions. Emissions monitoring and scenario modelling were identified as an important principle for managing carbon, estimating the level of impact and exploring policy and interventions, and to enable stakeholders to play an informed role in assessing effective climate mitigation strategies for their destination.

For destination management, how carbon measurement and reporting might be used appeared critical. Font, Walmsley, Cogotti, McCombes, and Häusler (2012) investigated the reliability of corporate carbon disclosure against actual performance, identifying a disclosure-performance gap, with inward-looking policies and eco-savings driven performance (reflecting economic and legal concerns). They found little acceptance of impacts, sustainable supply chains or ethical considerations. Similarly, Gössling (2009) noted that current approaches to carbon neutral destinations were “neither credible nor efficient” and in their current form could be seen as a marketing ploy to justify business-as-usual tourism development. Gössling (2009) identified the first stage towards credible carbon neutrality was to define boundaries and measure emissions. This again supports a case for consistent, objective and standardised national measurement and reporting for carbon. The thesis findings also suggest it is critical to engage stakeholders in discussion of the interpretation of data and the implications for policy, planning and broader destination governance.

Indicators are used (and determined) to assess social phenomena and policy responses, and are used for political power and action, for public awareness, and to provide a source of legitimacy and influence (Bauler, 2007). However, the relevance and success of indicators to inform decision-making towards sustainability have been questioned (Briassoulis, 2001; Bell and Morse, 2001, 2003). The influence and role of indicators in UK policy appears to be determined by their policy context and the beliefs of policy actors (Sébastien, Bauler and Lehtonen, 2014). A review of the Carbon Disclosure Project (Kolk et al, 2008) found that the greenhouse gas reporting mechanism achieved technical progress but failed to provide valuable information for policy makers and made little progress in relation to the cognitive and value dimensions. As de Grosbois (2012) pointed out, measurement and disclosure is not a substitute for actual change. It would appear, however, that the indicator development process can produce new perspectives and may have more potential to influence and affect policy-making than the indicators themselves (Scott and Bell, 2013), as a discursive element in the informal learning process (Ortega-Cerdà, 2005). For example, the UK *quality-of-life* indicators functioned to promote participation, deliberation, and induce different conceptions and shifts in the political arena (Scott and Bell, 2013).

Boyle (2001) examined the culture of indicators and targets in policy decisions and queried at what point data was beneficial or detrimental. He argued that many important things in life were given less importance, or ignored completely because they could not be measured. Laurent, Olsen and Hauschild (2012) argue that environmental management focusing exclusively on carbon footprints could inadvertently create other environmental impacts, or problem-shifting. For example, the production and use of biofuel to reduce emissions created other environmental impacts. The challenge would be to measure the right things (not just economic and business efficiency savings) and, crucially, reflect on how data and carbon indicators were applied to inform debate. Tourism is dynamic and multifaceted and measures of destination success should be understood through a range of values rather than a narrow economic or carbon picture of tourism activity – thus providing additional levels of depth to enrich and help interpret the data (Bonilla-Priego, Font, and Pacheco-Olivares, 2014).

6.2.5 Combining economic and carbon indicators

As discussed earlier, the short-term strategic drivers and success measures for tourism in destinations (and national tourism agencies) were found to be profit-orientated growth in visitors and expenditure (see also Bornhorst, Ritchie and Sheehan, 2010; and Jenkins and Nicholls, 2010). The carbon modelling showed, however, that this was currently correlated positively with increased emissions. Lee and Brahmasrene (2013) observed a long-run equilibrium relationship between tourism's influence on economic growth in the EU (European Union), and a clear relationship between economic growth and a rise in CO_2 emissions. The scenario modelling also identified that growth could be redefined to incorporate lower carbon forms of tourism through low-carbon management strategies, developing a more complementary relationship between economic prosperity and environmental protection. Lee and Brahmasrene (2013) concur that increased tourism in the EU did not have to lead to increased emissions if tourism were managed effectively and had significant policy and practice changes. As the results showed further growth severely restricts the ability to produce marked reductions in emissions.

Garrod and Fyall (1998) suggested that to promote sustainable tourism in practice needed an environmental economics approach based on macro-level environmental balance sheets to measure and evaluate conditions and place monetary values on non-market costs and benefits. Arguments against attaching monetary values to natural capital were that nature had value as an end in itself, irrespective of its relationship to people (Turner, Morse-Jones and Fisher, 2010; Salles, 2011). Ravenscroft (2010) suggested the problem of economics was the need to determine how the value of services could be broadened and measured in other ways than through price.

Markets are not always an appropriate mechanism to determine environmental values (Steiner, 1972; Hein, Van Koppen, and De Groot, 2006) but the findings of this thesis would suggest a transitional step to a low-carbon system could be through market reform and improved management, guided by environmental economics and broader accounting practices. Mazzanti (2002) supported this approach and argued values should be quantified in ways which linked economic value and environmental externalities, if sustainable forms of tourism were to be adopted by a wide range of tourism stakeholders.

The quantitative REAP Tourism results were used to estimate and integrate economic and carbon performance measures for the relative impact of visitors. The domestic staying visitor performed the best, with the highest per day spend (£47.04) and lowest CO_2e cost of 2% (£0.79) per night. The eco-efficiency of overseas staying visitors varied between destinations ranging from 4.92kg/£ (Gloucestershire) to 7.48kg/£ (Somerset) and depending on the destination were 4-

7 times the intensity of the domestic staying visitor (ranging from 0.85kg/£ to 1.17kg/£ for destinations in the South West). The eco-efficiency results showed that the most efficient visitor type was consistently the domestic staying visitor.

With the exception of Gössling et al. (2005, 2015), examining the eco-efficiency of tourism, and Munday et al. (2013), looking at economic value alongside carbon footprint outcomes using extended TSAs for Wales, limited studies examine economic and carbon tourism performance measures together for destinations. These studies were not directly comparable, due to the different methodologies. The findings nevertheless, support the case for the integration of economic and environmental (low-carbon) objectives and measures. This does not imply that carbon and economic accounting are mutually compatible, but that this approach could raise awareness and increase understanding of tensions and policy failures. Despite critiques (e.g. Limnios, Ghadouani, Schilizzi, and Mazzarol, 2009), a combined approach would seem necessary and could work to integrate and internalise a current externality, and reduce the chances of carbon mitigation being excluded in tourism decision making.

6.3 Low-Carbon Opportunities for Destinations

The qualitative research identified a number of strategic challenges and opportunities for DMOs on low-carbon tourism (section 5.3). Many of the challenges were also presented as opportunities, so were redefined as opportunities to aid analysis. The findings all related in some way to the governance of tourism activities and tourism destinations.

Ancona et al (2004) undertook work into organisational behaviour and processes in the context of managing for the future and suggested that organisational governance could be explored using three lenses:

- the strategic design perspective (termed here as the structural perspective);
- the political perspective; and
- the cultural perspective.

Ancona et al.'s three lenses had been applied previously to destination governance in Bosco Gurin, to examine the behaviour, roles and motivations of stakeholders (Padurean, 2010).

These three governance perspectives provided a framework to interpret the opportunities and were used to synthesise and categorise the findings from this thesis, summarised in Table 6.1. The eight major areas of opportunity identified from the qualitative research (section 5.4, Table 5.1) have been incorporated and expanded upon, using the quantitative findings and discussion from the preceding sections. Some opportunities also appeared to be cross-cutting in nature - for example, data and dialogue could be an opportunity across all three perspectives. Ancona et al.'s (2004) governance lenses were useful because it helped to consolidate the inter-related components. It also supports earlier claims that destination governance encompasses a multitude of cultural, strategic and political activities (Saarinen, 2001, 2004).

The following sections examine the three governance perspectives further and provide the basis for the transition framework proposed in section 6.4.

Table 6.1: Applying Ancona et al.'s three lenses of governance to the opportunities

Three Perspectives of Governance	Perspective Description	Cross-cutting Opportunities	Opportunities for Tourism Destinations
Cultural perspective	• Creation of meaning • Deeply held attitudes, values, beliefs and assumptions guide behaviour • Formed early and can be persistent	• Consistent and standardised carbon accounting (TSAs) • Integrated carbon and economic KPIs e.g. eco-efficiency • Facilitate stakeholder collaboration, dialogue and debate	• Improve carbon literacy • Increase low-carbon communications • Reveal and address contradictions • Demonstrate benefits and relevance • Improve tourism efficiency and resilience • Educate, train and capacity build on low-carbon tourism
Political perspective	• Varying interests of multiple stakeholders to control the agenda • Allocation of resources • Networks and coalitions emerge, submerge, converge and diverge • Priorities for policy and planning		• National government leadership • Align DCMS and DECC objectives • Identify low-carbon as a core priority • Extend national carbon reduction targets to tourism • Empower local government • Redefine policy and strategic success • Integrate tourism and transport planning
Structural perspective	• Structure and design of the organisation. • Formal roles, plans, procedures and regulations for governing. • Organisational-environmental fit: how well the organisational characteristics match the needs of the operating environment.		• Embed carbon mitigation in destination management e.g. plans • Target marketing for domestic and eco-efficient visitors • Legislate and regulate responsibility • Repurpose DMO remit and funding • Provide practical resources, incentives and support • Promote greener travel options

Source: Author, informed by Ancona et al (2004) and Padurean (2010)

6.3.1 Cultural

6.3.1.1 Acknowledge carbon impact and act to reduce emissions

A cultural shift within the governance process of destinations was found to be important for moving towards a low-carbon tourism system. The qualitative findings suggested that the embedded tourism culture and disproportionate focus in destinations was economic growth, with limited valuation of environmental and social benefits and costs. There was an absence of governance arrangements for managing environmental impacts and their effects on the long-term well-being of the sector. There was also an arguably unjustified targeting of long-haul international tourist markets over domestic markets, driven by a perception that international tourists provided a better return on investment and attracted 'new' foreign currency.

Current tourism indicators (visitor numbers and expenditure) could misguide tourism practice and policy away from the triple bottom line of sustainability. A key finding suggested the lack of sector specific carbon indicators and evidence was one reason why low-carbon change was not occurring in destinations. Some respondents suggested that climate mitigation was "too hard to deal with" and opened up a "hornets' nest", especially in relation to aviation. This was not surprising, considering aviation's contribution to emissions has been projected to grow to 29% by 2050 (Department for Transport, 2009), supporting findings by Gössling (2013) on the disproportionate impact of aviation.

Stakeholders working in destination governance and/or government tourism policy appeared oblivious or in a state of denial about the implications and opportunities of a low-carbon agenda, as the concepts of climate, transformation and low-carbon responsibility are increasingly common, if not mainstream (Moyle, McLennan, Ruhanen and Weiler, 2014). Gössling (2013, p440) similarly suggested that "there was very limited evidence that national tourism stakeholders or governments were concerned with such [emission reduction] scenarios".

The qualitative workshop results from this thesis however, demonstrated that carbon data and scenarios provided tourism stakeholders with information to justify a case for new tourism goals, management focus and provided the detail to enhance knowledge surrounding tourism's relationship with carbon. Improved data represented a critical first step towards facilitating carbon awareness of the need for mitigation in destinations. Stakeholders sought clarity and support on what should be measured, how to measure and how measurement would be used. This supported findings by Coles, Zschiegner and Dinan (2013), suggesting the tourism sector's response to climate mitigation required more evidence-based policy making. Hall et al. (2015) also called for greater use of scientific principles to ground debate on mitigation strategies.

6.3.1.2 Utilise stakeholder interest and address contradictions

This thesis revealed that managers of tourism destinations were not resistant to a low-carbon tourism economy and they recognised the potential for reducing tourism emissions. The findings demonstrated stakeholder awareness of policy failure and contradictions within the industry. An appetite to provide greater strategic leadership based around the discourses of economic sustainability and environmental/community sustainability emerged. Stakeholders acknowledged that it did not need to be an either-or situation and suggested that governments' preoccupation with a vibrant economy could inhibit recognition that this goal, together with lower-carbon tourism, could be achieved and be mutually beneficial.

There was demonstrable interest, ideas and motivation for the low-carbon agenda (from local and national level) as a current and future issue of concern. Research participants positively engaged with the opportunity to reflect on carbon mitigation and provided personal opinions away from their daily work lives. This finding was supported by Dwyer, Edwards, Mistilis, Roman, and Scott (2009), who found consensus amongst Australian tourism stakeholders that the tourism sector must mitigate and should make a fair contribution to reduce greenhouse gas emissions. The negligible signs of resistance were in contrast to findings by Scott and Becken (2010), who found stakeholder interest to be low, although they did not look at destinations specifically.

The importance of embracing the low-carbon agenda within tourism was acknowledged by research participants, but described as a “dilemma”. Stakeholders were generally positive, although responses suggested that it was difficult to speak out proactively about the topic and there was concern about their reputation and the consequences if they did. It was suggested that [business] members of the *industry* were not interested and saw it as a low level priority. Lorenzoni, Nicholson-Cole and Whitmarsh (2007) identified how it was possible for people to be highly motivated to change but de-motivated as a result of institutional forces outside their control. This thesis identified that participants felt disempowered and reluctant to act despite having a personal interest, indicating that low-carbon was not in line with the strategic business priorities or the views of their board members because of the perceived contradictions. Disempowerment and unwillingness to change to address climate change and tourism’s environmental impact, has also been identified in studies on tourist behaviour (McKercher et al., 2010; Hares et al., 2010; Miller et al., 2010; Barr, Gilg and Shaw, 2011).

This was a fundamental challenge emerging from the research and compounded the problem of lack of adoption. The perception of the low-carbon agenda was often presented as an issue of conflict, and therefore seen as a business dilemma and barrier. Mowforth and Munt (2009, p297) suggested tourism governance and policy needed to acknowledge competing interests and set them “within a broader and more critical framework”. Should climate and tourism policy objectives (low-carbon and business agendas) not be aligned and supported through practical guidance and facilitation, low-carbon tourism could remain philanthropic, supporting findings from research looking at the mitigation activities of accommodation providers in the South West of England (Coles, Zschiegner and Dinan, 2013).

6.3.1.3 Demonstrate the benefits and relevance of carbon mitigation

The case for carbon reduction could be derived from an economic efficiency standpoint, or linked more obviously to tourism’s economic performance measures, carbon mitigation might then be easier to acknowledge and comprehend. However, the quantitative and qualitative results also suggested that the required level of carbon reduction could not be achieved adequately within the context of the dominant ‘economic growth’ paradigm. This supported Hall’s (2011) argument for a significant change in governance and a paradigmatic shift in tourism policy and goals, over a modified version of ‘business as usual’.

The frustration experienced by stakeholders in this research revealed conflict and disparity within the tourism sector, in particular, the orientations of national tourism policy. It appeared that anomalies and evidence of policy failure was accumulating and revealing weaknesses in the present paradigm, with changing perceptions. This could reflect the ‘crisis stage’ of a paradigm shift (Kuhn, 2012), a force for change in tourism and policy learning (Hall, 2011, 2013), and in social systems (Jamal and Watt, 2011). Baggio (2008) described destinations as resilient and complex adaptive systems that would innovate to remain competitive.

The carbon footprint analysis proved to be valuable to demonstrate destination opportunities for low-carbon tourism. In addition, it could be expanded to investigate the impact of specific policy changes, adjustments in consumer consumption and vulnerability of the sector to energy availability and costs. The benefits and relevance of energy management and emissions reduction in tourism have been documented and practical and proven mitigation opportunities exist for the sector including restructuring, technological innovations, management, education, politics, behavioural change and research (Becken and Hay, 2007; Dickinson and Lumsdon, 2010; Gössling, 2011).

Contrary to other studies (Becken and Clapcott, 2011; Gössling, 2013), this research showed that stakeholders responsible for destination management understood the relevance of carbon mitigation and wanted to examine the vulnerability of tourism to energy cost increases and mitigation policy. However, they recognised that change would be needed in the way tourism decision makers and planners thought about, and conceptualised, the relationship and responsibilities of tourism to the destinations host community and environment.

This research provided an insight and understanding of the opportunities to inform and help facilitate a shift at destination level, accepting the limitations of the current tourism system, and identifying alternative approaches and the practical and conceptual change needed for a transition. Low-carbon transformations in tourism have occurred (Gössling, 2011), demonstrating signs of a shift, but the speed of change needed to reduce tourism emissions is not compatible with climate stabilisation goals (Gössling et al., 2010). The findings also suggested that the tourism sector could be entering the beginnings of a transition, where people start to think differently and begin to act, developing understandings and rationales for change and their role in the process (Geels and Schot, 2007). This would be a crucial exploration stage as it would reflect fresh thinking and a transition, which could be followed by commitment to change (Bridges, 2009).

Attitudes and social processes underlie a behavioural shift and cultural change, alongside knowledge and skills (Knott, Muers and Aldridge, 2008). The tourism stakeholders engaged in this research expressed interest, motivation and a will to engage in leadership on low-carbon tourism, providing a strong cultural basis for change. According to Festinger's (1962) theory of cognitive dissonance, frustration surrounding the capacity to act was due to motivations to reconcile expectations and reality. Individuals were motivated to reduce the dissonance, to bring their cognitions and actions into alignment. If people saw change as a new norm they could be empowered to take control and be proactive to ensure change was a positive experience, so arguably the best way to manage change, is to proactively create it (D'Ortenzio, 2012).

6.3.2 Political

6.3.2.1 Varying interests to control the tourism agenda

National UK tourism strategy has been driven by DCMS and VisitEngland and their members have been primarily representatives of industry with a business interest and economic focus. The research identified that responsibility for tourism management and/or DMOs at the destination level were often positioned within local government Economic Development Departments and responsibility lay with Economic Portfolio holders. Unsurprisingly, there was a strong economic and industry bias to strategy and the associated measures of success, despite tourism contributing both negatively and positively to social and environmental factors. The research found that destinations where sustainability was a core objective linked to a status, award, or a protected natural environment, were more amenable to low-carbon tourism. For example, the protected landscape model of management had an environmentally sustainable approach to managing tourism within a destination, due to the core priority being one of conservation.

Nordin and Svensson (2007) and Pechlaner, Volgger and Herntrei (2012) suggested that governance of destinations was about the roles and relations of actors and institutions, and the networks and partnerships existing between the public and private sector. It was therefore important to determine who governed, their roles, how governance was produced (Pechlaner et al., 2012), and how governance structures could be managed (Beritelli, Bieger and Laesser, 2007).

In terms of who governs, historically, stakeholders were narrowly defined as tourism business owners or associations. In more recent models of governance, the definition has been broadened to include residents and the voluntary and community sector (Padurean, 2010). Yang (2006) advocates a more collaborative approach to develop reciprocal relationships and common modes of management between stakeholders and destination managers. DMOs have been seen to encourage collaboration and participation to reconcile divergent interests amongst stakeholders and to involve them in tourism decision making (Sigala, 2010). However, more consistent change is needed to the structure and composition of tourism's institutional arrangements, and policy needs to be informed by public, private and community interests that involve think tanks, academia and NGOs (Godfrey, 1998; Pierre and Peters, 2000; Hall, 2011).

The literature appeared limited on the role of government in progressing low-carbon tourism, but several researchers have examined the critical role of government at both national and local levels for sustainable tourism (Wearing and Neil, 2009; Hall, 2008; Bramwell, 2011). Bramwell (2011) identified that, for sustainable tourism, further research was needed around the role of the state in regulating political and economic systems, the interactions between structure and agency, how state activities were adapted at different spatial scales and times, and the creation and dependence of different pathways. It could be argued however, that the centralised government system is being undermined by globalisation, and the decentralised local government system (or global governance structures) may be more appropriate to address climate change (Borne, 2010).

The research suggested that the tourism industry have considerable power and dominance in policy and decision making through their role on tourist boards and public-private sector partnerships. This could lead to tourism strategy determined primarily by business priorities, with little if any attention paid to socio-ecological factors such as emissions reduction, unless there was a significant environmental driver, board member interest or business advantage. The findings of this thesis identified that DMOs involved in this research were moving towards or were public-private or predominantly private partnerships with a promotion and marketing orientation and responsibility.

Arguably, this could distance DMOs from the broader public realm and destination management responsibilities dealt with by the public sector, such as environmental protection and carbon mitigation. Barley (2007) encouraged more attention to be paid to the role of organisations in society and how they could alter and create their environments, and raised concern about the privatisation of functions which had been the mandate of local government, suggesting this could undermine representative democracy and the public good. For example, the privatisation of DMOs could limit their ability to extend their vision and role beyond traditional marketing and business priorities. It could also reduce the degree of influence of local government and local communities on how destinations are marketed and managed.

This reflects the national policy shift to increase private sector involvement in the governance and development of the sector, and a move toward market-oriented and industry-led tourism policies and DMO structures with less involvement by state and local government (Kennell and Chaperon, 2013; DCMS, 2011). The appropriateness of this privatisation and localism agenda for carbon mitigation was questioned by the findings of this research, as it has been by Cooper and Pearce (2013), who considered the challenges of delivering national climate change policy and targets at the sub-national level. They found that action was limited by competing priorities, limited resources, difficulties in measuring outcomes, and fragmented responsibilities (Cooper and Pearce, 2013).

6.3.2.2 Resources, government control and collaboration

National and local government in England have provided core funding and other resources for tourism and transport programmes, upon which the DMOs depend[60]. Dinan, Hutchison and Coles (2011) found the majority of DMOs to be financially supported by local government even though public sector spending on tourism was discretionary. This provides a degree of power and authority and an external control factor for collaboration (De Araujo and Bramwell, 2002).

Local and national government could influence and direct their tourism expenditure, especially if leadership on carbon mitigation in tourism policy was strengthened (aligned to legislation). Government has considerable potential influence on DMOs in the context of legislative responsibilities for environmental protection (Crown, 1990) and land-use planning. Closer alignment of tourism to the low-carbon agenda could help to enhance public sector funding and support, as Cooper and Pearce (2013) demonstrated, most local authorities had adopted at least one of the three national climate change performance indicators. The qualitative findings demonstrated that DMOs were under-resourced and did not have the skills and capacity to act on broader issues such as carbon reduction, so direct linkages and a strong partnership with local government on these functions would seem a necessity.

[60] This is known as resource dependence, where funding or resources can drive or influence strategic direction (Pfeffer and Salancik, 2003).

Government involvement and leadership for a significant reduction in tourism emissions would appear vital, as the tourism market and industry is growing rapidly and responding slowly to climate change (McKercher et al, 2010). Stern (2006) described climate change as one of the greatest instances of market failure and identified state intervention as central to the response. In the present system where a hierarchical nature seemed to exist and where government institutions were responsible for tourism policy at different spatial scales, state government leadership was critical (Hall, 2008; Frey and George, 2010; Bramwell, 2011).

However, there are debates on market versus state involvement in environmental policy reform (Prins et al., 2009). It should be recognised, that not-for-profit and private-led approaches could also be valuable as they can put pressure on the public sector if they were reluctant to play a leading role. There are also limitations for the state in guiding and regulating tourism markets. These include vested interests and the political influence of commercial interest groups (e.g. aviation), unintended consequences, bureaucratic and regulatory restrictions and burdens, and the general movement towards privatisation and deregulation.

Collaborative efforts such as public-private partnerships (e.g. the UK Carbon Trust [61]) and private-private approaches (e.g. Airport Carbon Accreditation Scheme[62]) could also be advantageous and effective in mobilising change. The South West of England had not-for-profit and private-led examples in CoaST[63] and the South West Tourism Alliance. CoaST works with the tourism industry as a social enterprise network, driving ‘One Planet Tourism’. The South West Tourism Alliance exists as a not-for-profit regional industry-led consortium, guiding

[61] The UK Carbon Trust is a public-private partnership to develop and diffuse eco-innovation.

[62] Airport Carbon Accreditation is an independent, voluntary programme administered by WSP Environment & Energy, an international consultancy appointed by Airports Council International (ACI) Europe to enforce the accreditation criteria for airports on an annual basis. ACI represents over 450 airports in 45 European countries. http://www.airportcarbonaccredited.org/

[63] A social enterprise and a not for private profit business with the objective of ‘one planet tourism’: http://www.coastproject.co.uk/

sustainable and balanced development of the visitor economy. Despite having influence, both organisations struggled to make significant headway in reducing the sectors emissions because of their limited authority and resources.

6.3.2.3 Priorities for policy

Between 2005 and 2011, there was leadership in the area of low-carbon tourism for the South West. This was due in part to South West Tourism, which provided tourism governance through a process of consultation and collaboration with members and the industry. Sustainability was a core value and strategic objective (South West Tourism, 2005), reflected in the board membership (structure, roles and responsibilities) and the organisations workforce (approximately 10% had specific sustainability roles). This provided impetus and capacity for work on low-carbon tourism.

Some research participants specifically mentioned that South West Tourism provided low-carbon leadership and support, but since its closure in 2011 when Regional Development Agencies were disbanded, this gap had not been filled. The research suggested that the low-carbon agenda had declined in public and national interest due to changes in politics and the economic crisis. There was limited ownership and accountability for reducing emissions at a national level and positive incentives for those embracing this agenda were largely absent.

The research found that, with the exception of the South West regional Guiding Principles for Success (South West Tourism Alliance, 2011), carbon mitigation did not feature as a priority in tourism plans or strategic documents at the national or sub-regional destination level. The findings of this thesis demonstrated that certainly in the absence of regional government, there was a strong argument for national government to recognise carbon mitigation as a priority and induce change. This finding was supported by Ruhanen and Shakeela (2013), Gössling et al. (2010) and Giddens (2009), who identified the state as a key enabler and facilitator of action for climate change mitigation in tourism.

The UK national framework for reducing emissions has been identified in law (Crown, 2008), with national accounting mechanisms, periodic budgets and strategies in place to achieve reductions, but it has not been extended to tourism policy. This supports findings from Gössling et al. (2013) that climate policy for tourism was largely non-existent, making it difficult to develop a co-ordinated response at destination level. It was clear from this research that national responsibility for reducing emissions needed to be extended horizontally across government to include DCMS, with low-carbon principles and policy tracked and embedded into tourism strategy and performance monitoring, and subsequently extended vertically to local government level and DMOs. The national carbon reduction targets have a significant role in promoting action, informing priorities and providing a basis for accountability in destinations for carbon mitigation. However, the results demonstrated a minimal understanding of the relevance of the Climate Change Act (Crown, 2008) and carbon reduction targets for tourism. There also appeared to be little if any awareness of the WTTC (2009) greenhouse gas reduction target for the tourism sector of -50% by 2035 from a 2005 baseline.

Page and Thorn (2002) suggested that National Tourism Plans should set out the rationale for activity and targets relating to environmental protection. This research supports this view and found that internalising the environmental impacts of tourism through performance measures and goals could be a key component of progress and enable destinations to enact policy measures to accelerate change. This finding also corroborates the calls for leadership and support from national governments on emissions reduction and management (McKercher et al, 2010; Birchall, 2014).

Strategic leadership through low-carbon business priorities could help to remedy policy and market failure, through supporting legislation and interventions. It would seem that a collaborative governance approach is required, engaging public, private, voluntary and community sectors in developing and delivering a low-carbon vision for tourism. It was evident from this study that responsibilities and levels of control needed to be clearly identified at all levels and a system for accountability implemented, as identified by Dwyer and Kim (2003). The research suggested that if low-carbon tourism was recognised as an important objective by government, it would mobilise DMOs (and potentially industry bodies) to redefine roles and responsibilities and diversify the economic focus, translating carbon mitigation objectives (and national targets) into tourism planning and management activity at the destination level. This could also help to facilitate the alignment of marketing and management roles.

The qualitative findings suggested that national tourism policy concentrating on continued economic growth and international markets was somewhat removed and distanced from local tourism objectives and planning, where the requirements of communities and local government priorities also needed to be considered. At the local destination level, the need for tourism management was a more prominent and practical challenge and the social and environmental consequences of the industry appeared to be a more obvious responsibility. These crucial differences in national and local strategic tourism objectives need to be acknowledged within the institutional and strategic framework for tourism and challenges a hierarchical system in favour of more co-operative, two-way mechanisms. Despite the differences, this research found that both central government and local authorities had the functionality, jurisdiction, legislative powers and capability to deliver a strategic low-carbon tourism framework and enable action at the destination level.

6.3.3 Structural

6.3.3.1 Structures and functions

Research undertaken by Bornhorst et al. (2010) supports a finding of this thesis, that carbon accountability and management need to be integrated and institutionalised throughout the tourism system, through a cooperative multi-level destination governance process engaging national (state) and local government. Existing tourism structures and institutions do not appear fit for this purpose and arguably lead to inappropriate consumption practices and undesirable outcomes (Gössling, Scott, Hall, Ceron, and Dubois, 2012). However, it is not just about reforming the structural processes behind tourism production and consumption, but also the contradictions and debates between different interests and issues (Leroy and Van Tatenhove, 2000), and the limits of state action on a fragmented sector.

According to Hall (2011a), a different system with different rules would be needed, to balance the corporate and business focus in tourism decision-making and strategic planning. It is important to recognise tourism's reliance on a healthy supportive community, and links to many other sectors as a consumer of services, such as transport, food or utilities. How a DMO is chartered and who sits on the board, would therefore influence its vision, priorities and leadership (Wang, 2011). In addition, Bornhorst et al. (2010) demonstrated distinct differences in the viewpoints of tourism stakeholders on determinants of destination success, including divergence between the views of the CEOs and chairs of DMOs. Some groups have more influence than others on policy-making (Dredge and Jenkins, 2007) and therefore it is important to ensure the destination governance system and its composition (e.g. boards) be representative and include cross-sector, community and NGO representation.

Dwyer (2005) asserted measurement could facilitate greater strategic attention in tourism organisations. Knowledge management and destination performance have also been found to be important for innovation and for the success of DMOs and destinations (Bornhorst et al., 2010; Cooper, 2006). However, results showed knowledge management was limited with destinations gathering and investing in market research data, linked to their strategic focus on 'growth', rather than destination performance and capturing information which could inform improved management of destinations.

Carbon accounting and performance reporting would appear itself to be a form of low-carbon destination governance for enabling the institutionalisation of low-carbon tourism. By way of comparison, the Global Reporting Initiative (GRI), a voluntary corporate reporting framework of environmental and social performance, had been successful in capturing standardised information on emissions for benchmarking and ranking across a range of other sectors (Levy, Brown and De Jong, 2010; Knox-Hayes and Levy, 2011). Its success was attributable to its founders shifting and realigning the field of governance through analysis, strategy, leadership and organisational capacity building to gain corporate acceptance (Levy et al., 2010).

GRI's founders applied 'corporate social performance' with 'civil regulation' to propagate an idea that profitability could be improved by addressing environmental and social concerns (Russo and Fouts, 1997). This supported the findings of this research about the advantages of demonstrating the benefits to the industry of a low-carbon economy, including efficiency and resilience. The Carbon Disclosure Project is another example of a voluntary effort to develop standardised reporting procedures for firms which complemented financial accounts. There are also tourism sector specific accounting and benchmarking schemes such as the Airport Carbon Accreditation Scheme, which are gaining popularity. These schemes could be promoted by DMOs to encourage widespread energy and emissions monitoring by the industry, and promote carbon mitigation and management practice.

Regulation and legislation was identified by stakeholders as an opportunity and a priority action for enabling low-carbon destinations, alongside environmental and energy tax measures. It has been suggested that when stakeholders identify the need for regulatory reform to achieve change, this in itself demonstrates the need for active governance of a problem (Krutwaysho and Bramwell, 2010; Gössling et al., 2012). The support for extending legislative targets and monitoring requirements for emissions reduction to tourism, would also suggest a degree of policy failure in this regard.

The support for mandatory mechanisms for carbon management and mitigation, suggested that self-regulation, voluntary activity and market mechanisms alone were not sufficient. Similar findings were identified by Lane (2009) and Gössling and Scott (2012) in achieving sectoral change toward sustainability. Proactive support and a strong enabling environment is needed, alongside carbon reduction policy responses such as taxes, the EU Emissions Trading Scheme, grants and subsidies, and command and control through direct regulation (Kendall, 2012; Gössling et al, 2010). Further investigation of the impacts of the external enabling environment on the potential for a low-carbon tourism system is thus needed.

Peeters (2012) suggests that national and international legislation is inevitable for successful reductions in emissions and to create incentives for domestic and short-haul tourism. This is not to say that DMOs are not important in the leadership and delivery process, but that national and local government were critical agents in creating and sustaining change cultures. If the strategic and performance monitoring frameworks for tourism embraced carbon mitigation, it should naturally influence DMOs' remit, role and responsibilities, and provide impetus for more coherent and sustained action. Beyond regulation, public relations and organisational reputation can provide pressure to demonstrate emissions reductions (Okereke, 2007).

Carbon capability considers knowledge, motivation, skills, and the limits of individual action and understanding where collective action and wider governance solutions are needed (Waitt and Harada, 2012; Whitmarsh, Seyfang and O'Neill, 2011; Hall, 2013). The findings of this research revealed that DMOs have a perception of limited carbon capability when asked about their role and remit. The most relevant DMO activities of policy and planning, tourism development and research, monitoring performance, and sustainable tourism (the area's most likely to embrace carbon mitigation) were mentioned by only a few participants.

6.3.3.2 Roles and responsibilities

The primary role and responsibilities of DMOs were predominantly described as marketing, promotion and economic development with a focus on growing the visitor economy (supporting the findings of Ritchie and Crouch, 2003; Butler, 2010; Richardson and Fluker, 2008; Freezer, 2012). Local DMO objectives appeared to mirror the national tourism priorities for increasing tourist numbers and expenditure. The philosophical concept and principles associated with the ideals of local destination management (Wang and Pizam, 2011) seem to have been lost in translation to delivery, with DMOs essentially standing for Destination Marketing Organisations. The interpretation, purpose and practice of DMOs were shown to be ill-defined and inconsistent, and management of tourism in destinations seemed to be a misnomer. This has implications for carbon management, as DMOs have been described as "ideal entities to reduce the contribution of tourism to climate change" (Gössling, 2009, p33).

The ability of DMOs to deliver ‘management' functions and action strategies toward a low-carbon agenda was questioned in the findings of this research, as arguably unachievable within current structures and the primary focus on marketing. The perception was that DMOs were not in a position to deliver and orchestrate the changes, but were well positioned to be a conductor (or co-ordinator), working to co-create and communicate a common vision and strategy, establish links between multiple agencies and sectors, and share knowledge. This role is supported by Pechlaner et al. (2012), who suggested “through the destination governance lens, the DMO no longer sees its role as steering the network hierarchically, but instead defines itself as an intermediary and network manager” (p155). This thesis suggests that destination management should be a governance process and a philosophy.

In spite of the problems of marketization, the marketing function (which the research and Freezer (2012) identified as primarily promotion) plays a fundamental role in how tourists travel and consume, now and into the future (affecting the size of the carbon footprint). The REAP Tourism modelling enabled the researcher to investigate and compare the carbon footprint of different visitor types and trips. For example, a luxury break and a family holiday were compared against alternative ‘greener’ options where lower carbon choices or decisions were made. The results of the ‘lower’ carbon options were of particular interest because ‘total’ trip impact in terms of carbon was significantly reduced for both trips (58% and 40% respectively), yet in both circumstances there was an increase in trip length and expenditure. It demonstrated that despite the high daily impact associated with luxury breaks, ‘low-carbon’ consumer choices could reduce the footprint by 58%. The footprint results also demonstrated differences in tourist emissions over time, if the composition of close and distant markets changed. The findings respond to Gössling, Scott and Hall (2015, p208), that suggest it is “paramount for policy makers to understand the implications of various market mixes in generating emission growth”.

Even if a DMO was primarily marketing focused, there are governance opportunities to expand the understanding and delivery of marketing activity to achieve broader low-carbon management objectives, beyond growth. This raised questions as to whether local destinations should allow themselves to be market driven or have markets directed nationally, or whether the local destination and community should drive the tourist markets it wanted to attract. The REAP Tourism modelling, suggested that overseas visitors scored lowest in per visitor day spend (£41.20), had the poorest proportional eco-efficiency score, and the highest carbon cost of 8% per visitor day. A more appropriate target market for a low-carbon tourism economy would therefore seem to be high expenditure, low-carbon impact visitors. For the South West, this would suggest a domestic staying visitor market should be prioritised to reduce emissions and increase expenditure, and a concerted effort should be made to target short-haul over long-haul source markets to reduce the high overseas impact. This finding is supported by Gössling et al. (2015), who investigated the eco-efficiency of international tourists to 11 countries over a 15-year period. It should also be noted that because of the substantial tourism deficit in England (VisitBritain, 2013), the case for prioritising domestic high spend/low-carbon impact visitors would become even greater.

The theoretical approach to marketing could therefore be reframed towards social marketing helping to deliver low-carbon objectives and moving from the traditional ‘make and sell’ foundations of marketing, to a ‘guide and co-create’ perspective to improve social and environmental well-being (Peattie and Peattie, 2009; Truong and Hall, 2013; Whittlesea et al., 2015). This strategic market development approach to marketing activities could support a reduction in emissions and be a vital tool to change the culture and composition of tourism (Gössling, 2011;

Gössling et al., 2015; Whittlesea et al., 2015). For example, selective tourism marketing campaigns to facilitate lower-carbon trips, extending length of stay, reducing km travelled and promoting greener tourism products have the potential to be economically beneficial, enrich local communities and help protect the environment (Gössling et al., 2015; Whittlesea et al., 2015). In addition, increased product and consumer information on carbon impact could increase consumer awareness and be a force for change (Miller et al., 2010).

A number of tried-and-tested options do already exist for markets to help minimise emissions that might be applied to the tourism sector. For example, the private sector could extend existing sustainability mechanisms including eco-certification, corporate social responsibility, self-regulation, social marketing, and de-marketing, to drive low emission pathways. Another approach is to establish carbon markets through emission trading schemes (Giddens, 2009; IETA, 2013). Destination marketing strategies would need to adjust, developing closer alignment with the broader principles of destination management, and working to support and enable a transition to a lower-carbon tourism economy.

The findings suggested that the perception from some destination managers was that they had limited capacity to make choices independently and had little influence and control over the development and promotion of tourism products and services. This supported the findings of Butler (2004) and Wang and Pizam (2011). Further questioning however, identified a number of opportunities and significant potential for DMOs to influence and control certain activities, alongside a responsibility for action. Individually destination managers felt powerless, but collectively through partnerships and collaboration, and closer alignment with the broader social and environmental objectives of local government, low-carbon change through DMOs could be achievable. As the quantitative and qualitative findings of this research illustrated, DMOs have the potential to play a critical role in facilitating and delivering some of these low-carbon opportunities. In particular, they undertake marketing functions and influence product development, are an intermediary with businesses, influence visitor behaviour and travel choice, provide consumer information and education, and influence local tourism strategy and planning.

The research demonstrated that DMOs do have a degree of agency (capability and capacity to act independently) and efficacy (capacity to produce an effect or desired result). As questioned by Bornhorst et al., (2010, p586) “if the DMO does not provide leadership and direction for tourism development in the destination, who will?”. The research identified a role for local government as a partner and core funder, to formally integrate and drive carbon mitigation into the activity of DMOs. These included influencing criteria for funding and marketing, incentivising good practice, providing strong leadership, and embedding low-carbon principles.

6.4 Conceptual Low-Carbon Transition Framework

There is considerable overlap between the three different lenses of culture, politics and structure. For example, so much of what was discussed around structural change required political change, and the distinction between the political and structural components were not always clear or easy to disaggregate. This was also the case with the cultural component and it is important to emphasise that inter-relationships exist between all three of the lenses, reflecting the myriad of influences and elements comprising governance. The framework goes beyond the traditional DMO concepts of management and/or marketing, and recognises the complex and fragmented nature of tourism. In addition, responsibility and remit is extended to the whole governance system, recognising that to effect a change, the whole system of governance would need to shift.

In this section, a conceptual transition framework has been proposed, summarising the learning from this thesis and responding to the third research question, how can the opportunities be enabled? The framework presented in Figure 6.1 has been developed using the results of this thesis to provide some transitional guidance for low-carbon tourism in destinations. It was informed conceptually by Ancona et al.'s (2004) three lenses of organisational governance (discussed earlier) and integrates Kotter's (1996) eight stages for leading change. The lenses were used to frame the features for action which were identified as a consolidation of the thesis findings, in particular drawing on the opportunities and challenges identified by stakeholders and which were discussed in preceding sections.

The conceptual design of the framework has been represented as a Venn diagram with three interconnecting perspectives of equal importance recognising the social, cultural and political inter-relationships (and overlaps), and the dynamic and evolutionary nature of destinations (Saarinen, 2004). At the core of the framework is the co-creation of knowledge, through improved data, dialogue and debate. The framework is broad in scope and non-specific, allowing it to be applied to a range of destinations, at any stage of Butler's (2006) tourism area life-cycle, and could be looked at from each or all of the lenses. It has been suggested that a destination approach to reducing carbon emissions could lead to significant carbon reductions (Kolk et al., 2008; Gössling, 2009), but to affect change, researchers would need to communicate low-carbon options and strategies much more effectively (Hall et al., 2015).

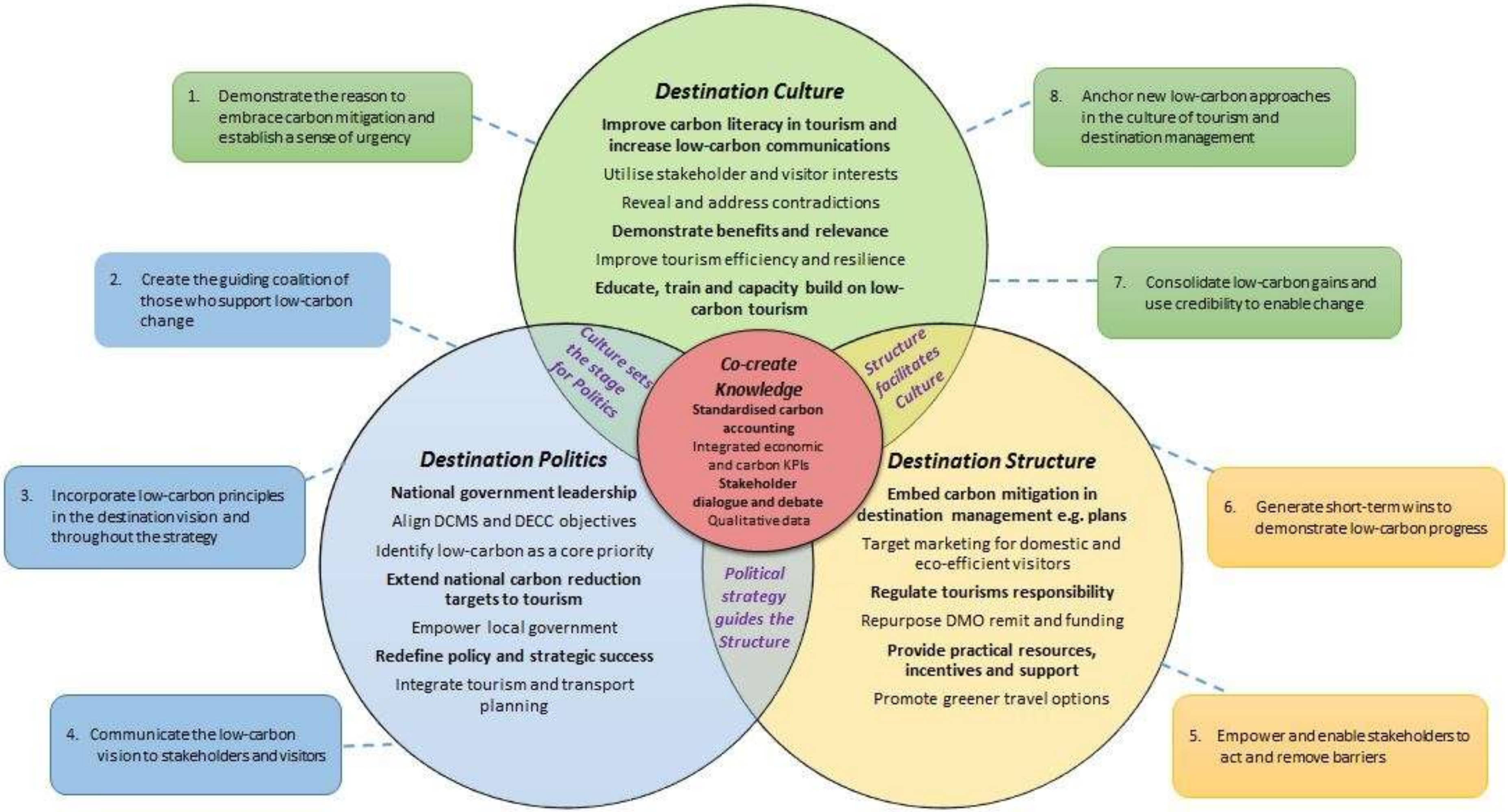
As Kuhn suggested, "profound awareness is a prerequisite to all acceptable changes of theory" (1970, p67). The primary strategic opportunities (including the reframed challenges) have been incorporated under the most appropriate lens and the following sections describe and analyse the framework.

6.4.1 Interpreting the framework

At the heart of the transition framework (Figure 6.1) is the co-creation of knowledge, through quantitative and qualitative data, and stakeholder dialogue and debate. This reflected the findings discussed in section 6.2, that measurement is a prerequisite for carbon management. The research suggested that economic and carbon accounting should be integrated or closely aligned, and that a standardised national accounting methodology and performance management system was required. For example, through environmentally-extended economic accounts (e.g. TSAs), and combined indicators such as eco-efficiency.

In combination with the quantitative data, interpretation and qualitative data was sought through stakeholder engagement and investigation. The participatory techniques were effective to explore low-carbon tourism opportunities with stakeholders, similar to multi-stakeholder policy networks proven to be successful for tourism and climate policy discussions in New Zealand (Becken and Clapcott, 2011). A key principle of transition management as a form of governance is to engage a wide range of stakeholders over multiple domains and levels, to create a shared long-term vision and goals (Loorbach, 2010). Low-carbon pathways can then be identified and subsequently tested for practicality through experimentation, learning and adaptation at the micro-level (e.g. selected destinations), to identify the best solutions before they are rolled out and incorporated into society (Foxon and Pearson, 2008).

Figure 6.1: Conceptual transition framework for governing low-carbon tourism



Source: Author (applying Ancona et al.'s 2004 three governance lenses and Kotter's 1996 eight stages of change)

Opening up dialogue with a wide range of stakeholders would help to create and sustain a broadly inclusive community of tourism advocates, politicians, businesses, NGOs and academics. It could help inform and create change in the cultural, political and structural components of governance and would require conscious effort to guide the required change. Non-hierarchical vertical and horizontal relationships and communications between tourism and cross-sector stakeholders are therefore important to develop and facilitate inclusive co-operation. This consensual approach could help promote mutual objectives and cooperation (Briassoulis, 2002; Presenza et al., 2005; d'Angella and Go, 2009) and develop new forms of collaborative governance and new partnerships needed for low-carbon tourism (Zeppel, 2012).

Culture as a governance lens was positioned purposefully at the top and associated with 'why do we need to change'. Although this lens was informed by the other lenses of politics and structure, the research results suggested this was a driving perspective for the governance system. It was about making the case as to why tourism destinations need to embrace low-carbon, and change (and challenge) the current high-carbon growth culture. This perspective was also closely aligned to the organisational attitudes, beliefs, values and assumptions guiding political and structural decisions. The core component of a strong vision, data and dialogue, are also likely to affect the cultural perspective.

The opportunities identified to improve low-carbon governance in respect of tourism culture were primarily to acknowledge tourism's carbon impacts, to improve carbon literacy, and increase communications about the relationship between tourism and climate change and how the sector could respond. Another key opportunity was to utilise the existing stakeholder and consumer interest in low-carbon and domestic tourism to shift culture and reveal and address current conflicts in government priorities, presenting alternative options and choice. Demonstrating the associated and hidden costs of tourism products and services, and of continued growth, could also guide behaviour. It would help to reveal the benefits and relevance of a low-carbon tourism system in terms of the economy, society and environment, and in terms of the sector's efficiency and resilience.

Politics is the second governance lens. This perspective considers the varying interests of multiple stakeholders and their control over the DMO agenda and function, and reflects upon 'who needs to change'. National government sets the national tourism and climate change agenda, and so is critical to steering and enabling low-carbon tourism practices at destination level. Strong political and government leadership was identified from the research, to align and integrate the priorities of DCMS and DECC for legislation and policy. For example, acknowledging the National Climate Change Act (Crown, 2008) and the associated carbon reduction targets in tourism priorities and plans. This requires a fundamental rethink of the definition and determinants of tourism success to incorporate carbon mitigation and needs government co-ordination for a strong low-carbon remit for those organisations responsible for tourism and destination management.

Government policy needs to guide and facilitate structural arrangements through empowerment and practical support for local government and DMOs. In terms of the interests and coalitions of destination stakeholders, this would vary between destinations depending upon their structural and cultural foundations. The results suggested that carbon data alongside dialogue and debate could inform the political perspective and the resulting priorities. Cross-sector stakeholder engagement and collaboration would appear critical and requires inclusive stakeholder co-operation, including transport and infrastructure planning.

Structure is the final governance perspective which considers ‘what needs to change’ in terms of roles and procedures. This lens is informed by the other two governance lenses, with culture setting the stage, and politics driving strategy and enabling structure to happen. The strategic opportunities identified to improve low-carbon governance in respect to tourism structure, were primarily the need to institutionalise and embed carbon management and emissions reduction. This should work to integrate low-carbon into destination tourism plans, products and marketing initiatives and avoid short-term fixes and bolt-on remedies. Marketing and management objectives integrated towards a low-carbon system, were critical to facilitate behaviour change and address contradictions internally and externally, with stakeholders and visitors. Enhancing education, training, skills and capacity for delivering low-carbon tourism, alongside the provision of resources and support, would help ensure an appropriate structure for low-carbon governance of tourism.

This co-evolutionary approach to transformative change means adjusting, adapting and influencing rather than a command and control mode (Loorbach, 2010). The rationale is that carbon mitigation is a persistent problem with no immediate solution and a diversity of experiments and options are needed until convergence is reached. Technological developments (e.g. low-carbon fuels) are a part of the solution, but as important, are societal changes such as user practices, regulation, industrial networks (supply, production, distribution), infrastructure, and culture (Geels, 2002; Verbong and Geels, 2010).

Finally, the framework incorporated Kotter’s (1996) eight stage process for creating major change to help illustrate how change could be enacted. Each stage has been adjusted to reflect leadership for a low-carbon transition and been aligned to each of Ancona et al.’s (2004) three governance lenses. Three stages (1, 7, 8) were associated with destination culture: demonstrating the reason to embrace carbon mitigation and establishing a sense of urgency; anchoring new low-carbon approaches in the culture of destinations; and consolidating low-carbon gains and using credibility to enable change.

Three stages (2, 3, 4) were allied to destination politics: creating the guiding coalition of those who support low-carbon change; incorporating low-carbon principles in the destination vision and strategy; and communicating the low-carbon vision to stakeholders and visitors. The final two stages (5, 6) were associated with destination structure: empowering and enabling stakeholders to act and remove barriers, and generating short-term wins to demonstrate low-carbon progress. Kotter's (1996) eight stages have often been presented in an orderly or systematic series, as they are here from 1 to 8. However, facilitating and leading major change on the low-carbon opportunities within destinations is not likely to be orderly and would require action in all eight stages as opportunities arise. The thesis findings suggest that national government should play a prominent role in refining and facilitating the transition, and delivering against relevant actions, to support local government and DMOs to 'orchestrate' the necessary change in tourism destinations.

6.4.2 Strengths and weaknesses

Nordin and Svensson (2007, p54) described governance in tourism as "an expression of the mutual dependency between governments and private tourism industry". However, governance towards sustainable tourism requires a co-ordinated and cooperative approach across sectors and policy, which is problematic to secure due to the different priorities, interests and beliefs of actors (Bramwell and Lane, 2000, 2010). The conceptual low-carbon transition framework for destination governance presented here was based on interpretation and examination of data from mediated stakeholder dialogue. This meant the ideas and solutions came from within and across the sector. Without, however, the carbon data and collective intellectual basis and comprehension for change, the framework might not be effective. There is clearly an important role for government (local and national) to lead on a consistent carbon measurement and policy framework for tourism if low-carbon is to move from idealist rhetoric to practical reality, requiring political will and drive. This supports Miller and Twining-Ward's (2005) assertion for a sustainable tourism transition, that a comprehensive systemic approach is needed whereby indicators and monitoring play a critical part.

The transition framework addresses the imperative for change through the cultural, political and structural perspectives of tourism governance to work toward the desired goal of reduced emissions. The future, however, cannot be predicted and the characteristics of socio-technical transitions are complex and a long term process. The rate of change varies over time, occurs at multiple levels, involves multiple actors, needs radical innovations, and is co-evolutionary and multi-dimensional (Geels, Hekkert and Jacobsson, 2008). A key limitation of the framework is that it is unlikely to create the speed of change required for a radical overhaul of theory and orientation. It would seem more suited to a longer timeframe where it could be incorporated gradually into current systems. Ultimately, it is the responsibility of politicians, government officials and destination/tourism managers to determine a high or low carbon tourism legacy, and in turn to intervene and activate low-carbon change and innovation.

Low-carbon tourism is a complex challenge for societies based on a high-carbon model. It will involve multiple multi-level stakeholders and processes, and could take decades to adjust. Critics of transition management acknowledge that such transitions can be ambivalent, messy, technocratic and questionable in democratic and financial terms (Shove and Walker, 2007; Scrase and Smith, 2009). Transitions or decisions taking different directions are problematic and difficult to manage or to divert. For example, patterns of tourism demand and visitor behaviour affect success and may be hard to transform, and transformations of infrastructure such as lower-carbon transport also take time and investment. There will be winners and losers, which will create divisions and fractures between opposing interests and ideologies.

That argument provides even more impetus to start the dialogue and to develop ideas and approaches to stimulate and facilitate low-carbon ideas and action. A consensual model of politics will be required, to manage the “discursive struggles between coalitions of actors and the institutional contexts in which these struggles take place” (Kern, 2012, p90). These constrain as well as enable new policy initiatives as seen with governing the transition to more sustainable energy systems, but are more likely to be successful if tied to dominant or emerging discourses (Kern, 2012).

A co-evolutionary and multi-stakeholder approach to delivering the framework is plausible, but has practical challenges. It would only be partially inclusive and political in nature, although the framework provides choice and multiple options for intervention by the various players. Arguably, some elements of the framework provide more leverage than others for guiding change, for example, a common low-carbon tourism vision and the integration of environmental and economic indicators. A low-carbon transition requires heightened sectoral awareness and more radical reform and shifts in tourism governance and policy goals than current culture, politics and structure seems to facilitate, described by Hall (2011) as third-order governance change.

The strengths of the framework are that it has drawn on the culmination of the thesis findings and evidence, and although it has been reduced to a simple framework, is useful to identify and disseminate pathways for action and further experimentation. It could help tourism destinations identify and explore opportunities and provide the basis to challenge conventional approaches.

An additional ‘strength’, is that the framework recognises different levels and stages of governance and is positively framed. There is value in an illusion of agency and the optimistic belief that a difference could be made; as Rip suggested, “illusions are productive because they motivate action and repair work, and thus something (whatever) is achieved” (2006, p94). The unknown implications of climate change alongside the identified stakeholder desire for change, could also be considerable drivers. As suggested by Shove and Walker (2007, p8), “The outcomes of actions are unknowable, the system un-steerable and the effects of deliberate intervention inherently unpredictable and ironically, it is this that sustains concepts of agency and management”.

It was apparent from the research that tourism stakeholders and the managers of DMOs wanted guidance, had an appetite for change, and had capability to help facilitate a low-carbon transition. A framework to support a transition, alongside the availability of carbon data, could provide the conception and knowledge to facilitate action; especially if a consensus were achieved to transform the dominant vision and actions of the current paradigm, to a more desirable configuration. The pressure for change needs to be articulated, the political and social actors mobilised, and the resources, capabilities and networks provided (Gössling et al., 2012).

6.5 Chapter Summary

This chapter further examined the results in relation to the three research questions. In response to the first research question, carbon footprinting was seen as an effective measure and tool to inform and engage tourism stakeholders. It challenged current thinking in destinations and furthered knowledge, particularly around the existing measures of tourism success. The modelling and scenario planning proved useful, but the unavailability of tourism carbon footprint data for destinations was identified as a key challenge, alongside the need for a consistent standardised methodology. There was support for tourism economic performance indicators to be combined or interpreted with carbon indicators, and the results demonstrated a case for the national carbon reduction targets to be extended to tourism policy and planning. It would suggest that carbon footprinting, indicators and targets are a pre-requisite for carbon management in tourism destinations.

In response to the second research question, the key strategic management challenges and opportunities were identified for destinations to move towards a low-carbon tourism system. It became apparent that an overriding challenge was the narrow strategic focus and orientation towards economic growth, and limited government strategic leadership for low-carbon tourism. This was not helped by the fragmented nature of the industry, the lack of capacity and incentives, and the limited strategic links made to travel and transport planning.

Opportunities exist to build on stakeholder interest and motivations, to use data and knowledge to demonstrate the business benefits and relevance of low-carbon, and to revisit the capabilities of DMOs to integrate and institutionalise carbon mitigation into destination marketing and management practices. Overall, the analysis revealed that a low-carbon transition in destinations was complex and affected by interconnected challenges and opportunities, most of which were primarily related to governance of the tourism sector. To help understand and examine this complexity, three governance lenses of culture, politics and structure (Ancona et al, 2004) were used to frame the findings.

The third and final research question examined how the strategic opportunities could be enabled. A transition framework was proposed synthesising the learning from the thesis and representing how carbon mitigation could be integrated into the governance of tourism in destinations. Ancona et al.'s (2004) three lenses of organisational governance and Kotter's (1996) eight stage process for leading change informed the conceptual depiction. It incorporated the challenges and opportunities identified, and recognised the evident value of carbon measurement and stakeholder discussion and debate as triggers in the process of change.

The transitional framework identified low-carbon opportunities and configurations for the governance of destinations. It highlighted possible pathways to facilitate change in governance and opportunities for action towards a paradigm change, despite the complexity and uncertainties that exist (Hall, 2011; Gössling et al., 2012). The framework could modify the context in which current destination governance operates, advocating affirmative action to achieve the goal of carbon reduction. It built on the learning from previous research and this thesis to address the challenges and embrace the opportunities, and to provide a mechanism to aid performative resistance to the current high carbon system.

7 Conclusion

7.1 Introduction

This thesis contributes to the empirical and conceptual understanding of low-carbon tourism and how it can be facilitated in destinations, by using the example of the South West of England. The praxis oriented research questions were developed through reflexive engagement with practitioners working at the destination level, to explore the complex challenge of carbon mitigation in tourism, within the context of global climate change imperatives. The empirical contribution of this thesis was to examine the carbon footprints of overseas, domestic and day visitors for multiple destinations, and to explore the challenges and opportunities for destinations to move towards lower-carbon tourism systems. The contribution to the conceptual development of tourism studies was through the development of a low-carbon transition framework, illustrating opportunities for low-carbon governance in destinations.

This chapter comprises five main sections. Section 7.2 summarises the key findings of the thesis and is structured by the research questions set out in section 1.3. Section 7.3 outlines the practical, conceptual and methodological contributions of the thesis. Section 7.4 critically assesses the limitations of the study and problems encountered. Section 7.5 identifies areas for further research and section 7.6 concludes the thesis.

7.2 Key Findings

The aims of this thesis were to investigate the effectiveness of carbon footprinting and scenario modelling to inform and influence tourism planning and management in destinations, and to examine the opportunities and challenges for implementing lower-carbon tourism pathways. The three research questions were formulated six years ago and at that time published academic research into low-carbon tourism practice at a local destination level was in its infancy. Despite the time lag and the increasing research in this field, the scope of the questions remains relevant.

The research arose from data and knowledge gaps identified by practitioners working in destination management, in terms of practical and conceptual guidance to reduce and manage tourism emissions. The thesis responded to these and the concluding findings presented here are structured by the three research questions.

RQ1. How effective is the carbon footprint to inform and engage tourism stakeholders in the transition to a low-carbon tourism economy?

Effectiveness of the carbon footprint data was determined by the quality of the modelling outputs and their usefulness in informing and engaging stakeholders in discussions about low-carbon tourism. The qualitative findings demonstrated that carbon footprint and scenario modelling was informative for stakeholders and provided the basis for constructive debate, clarifying areas for attention and opportunities for transition. The research identified carbon footprinting to be an effective tool for informing lower-carbon governance in destinations. In particular, it enhanced understanding of the scale and characteristics of issues requiring action and thus, creating and clarifying areas of accountability and agency to reduce emissions. A finding was that the absence of carbon data and performance measures for tourism was a reason why little strategic attention had been made to reducing tourism emissions.

The data were described as 'critical' to formalising the existence of carbon emissions, focussing attention, identifying areas where interventions could be applied, and illustrating potential tourism contributions to national emissions reduction targets. This research demonstrated that bringing cross-sector stakeholders together to discuss the data aided the identification and resolution of areas of conflict between segments of the sector, and provided opportunities for cross-sector collaboration and integration. The results suggested that combining carbon reduction and economic priorities together could be useful for decision-making. For example, by reviewing the economic and carbon impact of overseas versus domestic markets.

In order to fulfil its potential contribution to low-carbon transitions in tourism, the carbon footprint indicator would need to be integrated into national performance frameworks led by the Department of Culture, Media and Sport and VisitEngland. The research identified the need for a national standardised top-down carbon accounting and reporting mechanism, recognising travel to and from the destination and other significant consumption categories such as food and shopping. In order to fulfil its potential, such modelling would need to distinguish between different tourist types and build on existing economic and performance accounting practices and input-output methodologies, such as Tourism Satellite Accounts (TSAs) (see United Nations, 2010b). This would increase the likelihood of a transition, politically, strategically and culturally. Whether the data and outcomes would, in reality, bring about sustained changes in behaviour at an individual or collective level requires further investigation.

In turn, integrated economic and carbon indicators could be utilised (e.g. eco-efficiency or carbon per GBP spent) and growth targets revisited for a low-carbon system. This would help to integrate national government agendas for economic growth and carbon mitigation. It would also help reveal the tensions which need to be addressed, in order to create a more complementary relationship between economic prosperity and environmental protection. These integrated indicators could be gathered and reported for all tourism destination areas, enabling benchmarking and the recognition of differences between destinations and their visitor economies. The research indicated that current tourism Key Performance

Indicators (KPIs) were directly linked to national tourism priorities and policy, suggesting that this was a critical governance area to address if carbon reduction were to become integrated into the strategic and competitive frameworks for tourism.

The Climate Change Act (Crown, 2008) includes national carbon budgets and performance monitoring arrangements. Extending these to include aviation and recognise tourism as a cross-cutting sector should influence funding, strategy, accountability and planning. For example, transport and business were identified as key sectors within the UK Carbon Plan (HM Government, 2011), both of which are directly relevant to the tourism industry. There is therefore, already a strong case for integrating low-carbon principles into tourism policy and performance assessment. The national strategic and competitive frameworks for tourism (ONS, 2010; DCMS, 2011; DCMS, 2014; DCMS, 2015b; VisitEngland, 2011; VisitEngland, 2015) should be broadened to acknowledge the national emission reduction target. Such a shift would need to include legislative requirements and mechanisms to incorporate carbon measurement and management in tourism, as the findings of this thesis indicate that bottom-up activity and market mechanisms were insufficient.

The most prominent finding relating to the value of carbon footprinting as a performance measure was that the data challenged the thinking of destination stakeholders and enabled constructive discussions about conflicting priorities. The workshops enabled stakeholders to reflect upon management opportunities and challenges arising from a move towards a low-carbon tourism system. The carbon modelling challenged perceptions and contradictions, especially the notion that a low-carbon tourism system has negative economic implications.

The modelling demonstrated that shifting the focus from international to domestic visitors could have significant economic and carbon implications for the destination. Domestic visitors spent more money in the destination than international visitors on a per night basis and were shown to have the best eco-efficiency rating, reducing the carbon impact and per capita emissions of the destination visitor economy. Increasing the number of carbon friendly domestic tourists and lengthening their overnight stay, would reduce the national tourism deficit (currently £15 billion) by redirecting money back into the UK economy, resulting in economic gains and carbon reduction benefits. This finding had major implications for stakeholder perceptions about the opportunities for a transition to a low carbon tourism system.

RQ2. What are the strategic opportunities and challenges for a low-carbon transition in tourism destinations?

A transition towards a low-carbon tourism economy in destinations in the South West of England appeared a future ideal, rather than current reality. There was limited activity at the destination level, although the research identified marketing and management opportunities to mobilise change. The strategic opportunities related to cultural, political and structural components of tourism governance in destinations. The detail was discussed in chapters 6 and 7 and the findings were incorporated into the transition framework (see Figure 6.1). A significant finding relating to organisational change was that destination managers were willing to provide strategic and operational leadership, but felt disempowered. There was a perception that they had limited capacity to act and make choices which might be considered counter to the culture of destination management which currently promoted growth. The research revealed that there was potential capacity to reduce emissions at a destination level, but that DMOs did not see carbon mitigation as a priority and were predominantly driven by private sector interests and narrow economic goals.

The current neoliberal and decentralised approach to managing tourism in destinations appears to have created marketing orientated and industry dominated Destination Management Organisations (DMOs), distanced from the destination community. Concerns about environmental and social justice, therefore, are often overlooked. The research demonstrated that from a political perspective, national and local government would need to provide intervention and leadership if low-carbon tourism was to become an integral part of tourism destination management objectives and operations. The results indicated that greater political will was necessary to institutionalise low-carbon into the tourism agenda and to recognise it as a priority in its own right but also for economic stability. A shift in national tourism priorities and performance measures towards low-carbon tourism could subsequently lead to integration into the governance and performance management frameworks of destinations. This change in tourism discourse has environmental, economic and social justifications, and could redirect the strategic direction and goals toward low-carbon tourism.

This thesis identified challenges created by the current lack of carbon data and associated performance measures related to tourism, the limited consideration of the low-carbon agenda within tourism policy and plans, and the absence of national government leadership and subsequent legislative emission reduction targets. It would appear that carbon footprint data and interpretation would be critically important for tourism, providing a significant strategic management tool for aligning economic and carbon mitigation performance measures and targets.

Focussing on such options could provide a way of developing new forms of praxis for destinations across the South West of England and beyond, to underpin low-carbon tourism economies. The findings suggested that low-carbon discourse could be facilitated at the destination level through cultural, political and structural mechanisms. From this research finding, the low-carbon transition framework was developed to provide some guidance.

RQ3. How can the opportunities be enabled?

Given that there are destination opportunities for a low-carbon transition, the next step was a conceptual framework to consider how the strategies and reductions identified in the research could be enabled.

The framework used Ancona et al.'s (2004) three perspectives of governance to synthesise the thesis results in terms of key opportunities for destinations, to portray how change could be enabled (the why, who and what). If the low-carbon transition framework worked to guide action, addressing a number of the current challenges and contradictions, the resulting shifts and solutions might have the potential to form a new dominant paradigm (Kuhn, 2012). Hall (2011) identified a need for significant paradigmatic change in governance for a low-carbon tourism system. This thesis examined 'how' tourism destinations could respond, attempting to expand knowledge and provide a framework towards a low-carbon tourism economy. It could be argued it has over-simplified a highly complex area; however, the complexity of the system (e.g. range of actors, strategic orientations, fragmentation) might have limited action.

The framework drew on the knowledge and insights from the analysis, to set out a broad roadmap for those working in tourism planning or destination management (Figure 6.1). The roadmap could not provide the power, authority or resources, but could provide direction to inform discussion and decisions as to how low carbon policy and strategies can be enabled. Tourism stakeholders engaged in this research exhibited capacity, energy and interest in how low-carbon policies and strategies could be implemented. They also indicated the need for change and leadership to prioritise low-carbon destination management.

The transition to a low-carbon tourism system in destinations requires integrated systems thinking which challenges current assumptions and reconceptualise tourism to broaden its value and benefits beyond economic growth. The research identified the systemic nature of carbon throughout the tourism system. Bolt-on approaches to carbon mitigation that graft solutions onto existing models, tended to result in temporary and piecemeal improvements. A positive reframing of carbon mitigation, from a perceived issue of conflict to a complementary agent, could help drive an efficient economic system with significant social and environmental gains. Acknowledging present contradictions and redefining what is valued and what determines tourism success would be a key strategic opportunity.

The destination level is a fundamental unit for tourism management and the role and responsibility of local government and the DMO critical. However, the current role and remit is predominantly (if not exclusively) marketing for growth with an accompanying growth in emissions. There is no consistent DMO model or framework, and government budget cuts alongside changes to tourism policy, have led to an increase in public-private sector partnerships and industry-led marketing bodies. This reinforces high-carbon corporatist modes of tourism development. This is not to say that marketing and management could not support a low-carbon agenda, but it would need to be an integrated component of a wider tourism governance system facilitating a low-carbon shift.

The proposed low-carbon transition framework resulting from this thesis provides guidance for moving towards low-carbon destinations in the SW of England and across the UK. It recognises the critical role of national government in the strategic governance of tourism in destinations. It provides a template to engage practitioners and to develop new strategic thinking, suggesting that the institutional-democratic pathway is more likely to drive change in destinations than economic-technological routes.

Whether the outcomes of this study might help or facilitate change toward a low-carbon tourism system in destinations is uncertain. However, it demonstrates that tourism carbon accounting at the destination level enriches and broadens knowledge from which to base strategic and economic decisions. The findings highlight how tourism and destination management professionals have become indoctrinated by traditional performance indicators as the compass for the industry, yet there was considerable interest and will to expand these measures to incorporate carbon - an important step in a paradigm shift towards the transition to a low-carbon tourism system.

7.3 Contribution to Knowledge

7.3.1 Policy and practice

This research contributes to an emerging body of knowledge on the governance of low-carbon tourism destinations in policy and practice (Hall, 2010; 2011a; 2011b; Gössling and Schumacher, 2010 Gössling, 2012; Zeppel, 2012; Gössling et al., 2012; Gössling, 2013; Cohen et al, 2014). The literature review identified a paucity of tourism studies that examined carbon footprints across multiple destinations. In addition, there was limited literature on the use of carbon data as a basis for stakeholder dialogue, to co-create knowledge and lower-carbon opportunities.

The research examined a significant gap, that tourism policy and performance monitoring does not recognise the requirements and relevance of the Climate Change Act (Crown, 2008). The research findings show distinct signs of policy failure in this regard, as tourism is a significant carbon emitter. A policy recommendation would be the extension of the UK national emissions reduction targets and plans to give greater recognition to cross-cutting industrial sectors, such as tourism, as functional categories. Components of the tourism sector are currently recognised in national carbon accounts, such as transport, business, agriculture, waste management, energy supply and industrial processes, but in a fragmented way that impedes integrated policy. The inclusion of international aviation and shipping emissions in the UK's carbon budgets is still to be resolved (DECC, 2012) but is an important further avenue for reducing emissions. Even if inclusion is achieved, policy linkages would be needed to help steer tourism plans and investment. The government's current tourism five-point plan (DCMS, 2015b) could work in opposition to carbon reduction goals and government plans to tackle climate change (Crown, 2009a), as no obvious policy linkages have been made.

The proposed framework could therefore prove useful as a policy and practical guidance tool for tourism practitioners and leaders at the national (DCMS, VisitEngland) and local destination level (local government, DMOs, Area Tourism Partnerships). The strengths of the framework are its simplicity and opportunistic focus on what could be done from different governance perspectives to progress a low-carbon transition.

To galvanise change the framework needs to be acknowledged by key governing bodies and local stakeholders, and requires leadership to develop the conditions and mechanisms to realise the opportunities identified. This research primarily focussed on sub-regional DMOs, but it became apparent that national strategic leadership on low-carbon from government and tourism bodies such as VisitEngland would be necessary for conceptual and practical shifts to occur. The transition framework identified a number of priority actions under the political lens, and suggests that the political components help to facilitate the shifts needed in strategy, structure and culture (e.g. government leadership and alignment of policy).

Government recently announced their Five Point Plan (DCMS, 2015a) to grow tourism across the UK. There is again emphasis on growth, income, jobs and overseas visitors but no reference to managing tourism's environmental or social consequences. Carbon mitigation was not mentioned. The plan recognised that travel, tourism and hospitality sectors were growing fast but did not recognise environmental and social constraints or the opportunities and challenges of a shift toward a greener and cleaner tourism economy. Arguably, the way the Five Point Plan is framed does not contribute to a decrease in carbon emissions from the tourism sector. However, there are mechanisms for enacting change to enable low-carbon tourism systems. For example, there is a commitment to forge links between transport and tourism and even though their focus is to help visitors travel outside the capital, this could create the necessary links for low-carbon transport planning.

National government leadership requires a rethink of the current focus of tourism policy approaches on decentralisation and privatisation. Contrary to national and international tourism objectives (DCMS, 2011; UNWTO, 2015b), the findings of this thesis suggest that if DMOs are to deliver low-carbon tourism, they should retain a firm footing within the public sector and should not be outsourced to the private sector. In addition, national marketing objectives and target markets should be revisited (especially the principal emphasis on overseas visitors[64]) - for example, to provide more focus on domestic and overland marketing campaigns. It was evident that closer links were needed between tourism and transport policy and planning to address the impacts of aviation and other travel to and from destinations. This also applied to creating stronger policy to reduce emissions associated with business operations and the production and distribution of food.

In terms of practice beyond direct policy implications, the framework identified key priority areas through structural and cultural lenses. The structural dimension requires destinations to institutionalise low-carbon activities in order to embed

[64] The first of VisitEngland's four national tourism objectives is to increase England's share of the global visitor market.

carbon mitigation into tourism policies, plans and products and to monitor performance of low-carbon tourism KPIs. The research identified the low-carbon capabilities of destinations and the need to integrate marketing and management functions alongside adequate resources, training and capacity building. A crucial role was identified for local government to provide leadership and ensure DMOs were guided and supported to develop low-carbon business models. In terms of culture, the key practical priorities related to acknowledging the need to reduce tourism carbon emissions, utilise stakeholder interests and demonstrate the benefits of low-carbon emphases for the tourism sector.

Summing up, the framework provides a heuristic tool to help politicians and practitioners consider how they might address present policy shortcomings. Improved carbon footprint data could provide evidence and greater confidence for government and DMOs to provide leadership in reorienting tourism goals and practices, whilst creating avenues for discussion of issues with the wider tourism industry. Acknowledging low-carbon tourism as a practical, political and cultural goal is a critical first step in facilitating innovation and a sector-wide response.

7.3.2 Conceptual

This thesis makes three conceptual contributions to tourism studies and the low carbon agenda. The first is an integrated systems thinking approach to low-carbon destination governance, incorporating a complex sustainability problem with change management principles (Kotter, 1996). Destination management is reconceptualised as an enabler and the value and benefits broadened beyond economic growth. In particular, the framework moves away from a static hierarchical model based on criteria or implying the need to follow a series of steps or rules. Instead it was designed to be holistic, offering different lenses to approach the topic and promote systems thinking, where the start could be at any point and facilitates a more creative approach and interpretation. The need for facilitated discussion and debate alongside the availability of standardised data was identified as a central component, within the conceptual framework, to widen interpretation and use the carbon footprint to inform the path, rather than be driven by it.

The second is use of the concept of change management. Although this is not new and is well established in the fields of corporate tourism management, it is less evident in the field of destination governance, especially relating to low-carbon. The transition framework developed as a result of this thesis drew on the research results, the literature and on models for corporate governance (Ancona et al., 2004) and leadership for change (Kotter, 1996). It is a conceptual framework developed from analysis of the thesis findings and detailed questioning.

Lastly, a conceptual contribution of the thesis was to demonstrate the value of critical conceptual learning in developing tourism policy and strategy. The thesis process demonstrated that economic growth and carbon mitigation were not axiomatically incompatible and could be integrated to create a common goal. Stakeholder views supported this finding and suggested that this integrated goal had the potential to influence measures of success, strategy and plans for the sector's benefit. This broadened conceptual understanding would seem beneficial, that the economy could benefit from environmentalism and profitably decouple environmental degradation from economic growth (Mol, Sonnenfeld and Spaargaren, 2009). However, a move towards a greener economy would require current conceptualisations of economic growth to be revolutionised, to enable transition pathways to emerge and co-exist (Schulz and Bailey, 2014). It could be described as a paradigm shift or a new way of thinking about tourism success, but either way, the factual information and carbon data need to contribute to an end beyond itself, by facilitating learning and enlarging the sense of what could be possible.

Further conceptual learning related to the fluid and inconsistent social construction of DMOs, where the theoretical interpretation did not appear to align with the reality on the ground. The term ‘destination management organisation’ would appear to be a misnomer as they primarily facilitate tourism growth through promotional marketing, and rarely seem to contribute to the management of a destination.

7.3.3 Methodological

The REAP Tourism footprint and scenario tool was designed and developed by the author in partnership with the Stockholm Environment Institute (SEI) in 2008, drawing on input from a range of stakeholders across the South West. The tool was developed from early work undertaken by Gössling (2002), and Becken and Simmons (2002) and responded to practitioner needs and a research gap identified in a report for DEFRA on mapping evidence and trends in sustainable tourism (SQW Consulting, 2007). The design aligned with the Greenhouse Gas Protocol and a combination of attributes made the tool and its outputs unique, in particular adopting a ‘consumption’ approach.

The ‘consumption’ approach for carbon accounting utilised for this research could be extended to national emissions accounting, as an addition to enrich understanding from the traditional approach that only accounts for emissions associated with ‘production’. A functional ‘consumption’ perspective related to consumer habits might be more appropriate to adjust and inform action and behaviour change such as tourism choice. Production and consumption accounting perspectives were discussed in the Literature Review (section 2.4.3.2) and both provided an important contextual understanding and contribution to inform low-carbon transition studies.

Importantly, the tool applied a consistent footprinting methodology at local destination level across an entire region. The methodology was aligned with the standard REAP footprinting tool for communities, enabling footprint comparisons between tourists and local residents. This enabled intra-destination and sub-regional comparisons and benchmarking to expose performance variability, examine destination differences, and explore visitor types and management responses.

The REAP Tourism tool is innovative in its design and structure. It provides a detailed breakdown of the carbon footprint into eight components; this includes food, shopping and services used by tourists, which are rarely modelled. This presented a more complete and detailed account of visitor impact. The tool also has a scenario modelling function which allowed alternative future scenarios to be consistently applied across the South West region.

The spatial dimension and multiple functional components of the carbon footprinting was critical for the analysis and demonstrated the intrinsic links to other sectors and systems, together with the benefit of an integrated systems approach. Schulz and Bailey (2014, p288) recognised the complexity of a shift toward a green economy and post-growth regimes and suggested: “a more explicit focus on the functional and spatial aspects of the green economy and their interrelationships may provide useful devices for configuring analysis of the multitude of relational geographies involved in the making, operation and governance of the green economy”.

7.4 Limitations

The limitations of the research centre on the methodological aspects of the study and the limitations of the researcher. The strengths and weaknesses of the findings and the conceptual framework were discussed in Chapter 6.

In terms of the carbon footprint and the REAP Tourism tool, limitations and weaknesses were identified in section 2.4.4 (Table 2.6) and section 3.3.2. The most critical issues were the timeliness and robustness of data sets (tourism and carbon) used for the modelling, an inherent problem for all indicators. The carbon footprint was difficult and complex to measure and only ever an estimate in a point in time (similar challenges exist with indicators such as GDP). Obtaining the balance between robust and rigorous measurement versus a simple and easily applied tool, which destination managers can understand and use, is challenging. If too complicated, people would be unable to use and apply it without continuous support (Whittlesea and Owen, 2012). The multifaceted and fragmented nature of tourism emissions makes it hard to disaggregate and re-aggregate data, so there are challenges in determining what to include or exclude from the scope of emissions studies (Whittlesea and Owen, 2012).

The research illustrated substantial variance in tourism carbon footprinting studies in terms of scope and methodologies and the resulting challenges in comparing studies. The unique top-down and bottom-up approach used for the REAP Tourism model also had its limitations when compared with other studies, as it did not easily align with the Tourism Satellite Accounts and top-down economic modelling estimates and models. These limitations are important to acknowledge, however caution needs to be taken not to get lost in the micro detail and lose sight of the reason for the estimates, which were to inform direction of travel and course of action.

The modelled carbon scenarios were directed by existing research and literature, in terms of what to model and what proportions. There was marginal input from stakeholders. Given more time, more regular stakeholder input and review would be sought. The limitations of scenario planning and the use of projective techniques were covered in section 3.4.2.

On reflection, and with more workshops, it could have been insightful to have undertaken a ‘control’ workshop without the REAP data to see how much the carbon modelling data affected stakeholder perceptions and views. Alternatively, or in addition, more information could have been captured about stakeholders’ judgements and attitudes in relation to pro-environmental behaviour and carbon mitigation, before and after the workshops.

The design of the semi-structured interviews could have sought more information on the personal versus organisational opportunities and challenges and could have examined further the perceived levels of influence, capability and responsibility in relation to the three governance lenses. However, this learning only transpired as a result of analysing the research results.

The interview sample covered the majority of DMO managers in the SW of England (67%) and captured views from some key national stakeholders. However, it could have been extended to include the Chairs of DMOs and other board members and could have engaged more tourism industry bodies to ascertain any differences between their viewpoints. The South West region was chosen for the study because of its ‘green’ history and considerable investment in sustainable tourism (Coles, 2008). This provides an avenue for future research to explore the replicability of the study by expanding to other regions of the UK and to other countries with different environmental and political ideologies. Further investigation would be needed if the specific challenges and opportunities, and framework principles, were to be applied to destinations outside the South West or to other countries.

The researcher's previous advocacy role and interest in the area of study might also be seen as a limitation, as the remit was to work with the region's DMOs to embed sustainability. However, it could also be seen as beneficial, in that a degree of existing rapport and respect existed with stakeholders and there was practical understanding and insight.

The qualitative methodologies employed worked to reduce limitations and enhance validity through careful design and methodological triangulation, drawing on data from three different sources (workshops, evaluation questionnaires and semi-structured interviews). The interpretation of the qualitative results and analysis used NVivo and the researcher was conscious of the need to remain as objective as possible. There was a considerable amount of data generated, proving challenging to manage and analyse, particularly in relation to comparability, but the triangulation of data demonstrated consistency in the findings. The limitations indicated directions for related future work and this is detailed in the next section.

7.5 Further Research

7.5.1 Expanding the scope of the study and testing the framework

The thesis findings revealed a number of areas for future research. Reflexive research would be needed in the field to apply and implement, or empirically test, the framework for its relevance and use. Targeted research could be undertaken with destinations more progressive in low-carbon initiatives and those less enthusiastic, to evaluate their views, governance and strategic arrangements against the framework. Application in different regions and countries could further develop and refine the framework, distinguishing between those seeming engaged and those seeming disengaged in the low-carbon agenda.

DMOs that were private or public-private partnerships appeared to have more of a promotion and marketing orientation and seemed less concerned about carbon mitigation than DMOs managed by the public sector. This could be examined further to investigate whether this limited the scope and ability to extend the DMO remit and role to include low-carbon. It would also be insightful to examine in detail the governance arrangements of low-carbon destinations and their evolution over time, investigating shifting coalitions, priorities and achievements.

7.5.2 Stakeholder analysis and policy learning

Future research could expand the breadth of DMO actors engaged within a destination and investigate the various strategies and viewpoints on low-carbon tourism, to gain better insight into the interactions and scope for leadership and innovation. The interviews conducted for this research could be enriched and broadened to include additional national government tourism and climate representatives and politicians, especially in light of the findings and the key strategic leadership role the state needs to play. Network and stakeholder analysis could help to further examine the relationships between different actors and tiers of tourism governance. More work is needed to examine the extent to which, and why, national government and politicians seem not to be recognising carbon mitigation as a priority in tourism and not providing low-carbon leadership in tourism policy and plans (despite it being a national priority and legal obligation in the Climate Change Act: Crown, 2008).

A detailed desk-top review of climate mitigation responses and content analysis could be completed, drawn from tourism destination reports, websites, plans and strategies. For example, Zeppel and Beaumont (2012) undertook a detailed review of climate mitigation responses (initiatives and implementation) by Australian Tourism agencies and the role they played to encourage uptake by the industry. A thorough analysis of DMO strategic and planning/policy documents across the UK could be undertaken, to examine the themes emerging over a fixed timeframe, paying particular attention to indicators and measurement, economics and growth, climate and carbon.

A policy learning approach could be applied to further examine the views of tourism stakeholders, politicians and government (local and national) representatives on tourism and climate mitigation policy and strategies in destinations. It would be insightful to examine views on the acceptance and implementation of the various components of the low-carbon framework and their responses to steady state and de-growth approaches to tourism. This could engage different actors and agencies and explore their opinions, in particular private sector interests influencing tourism policy and/or destination management at the national and local level. There could also be further investigation with DMOs and national tourism bodies in relation to social and environmental accountability and monitoring, examining their internal and external reporting processes and the effectiveness of targets and KPIs as a driver for change.

7.5.3 Extending the footprinting to other destinations and timeframes

Obtaining more recent data and updating the emissions factors would provide an opportunity to examine the carbon footprints over time and to conduct time series footprint comparisons. This would be useful to examine whether the size of the footprints changed, and where and how any observed, aligned with changes in policy and practice. The reliability of the results for other destinations could also be examined, by extending the footprinting and comparative data beyond the South West and the UK.

7.6 Concluding Remarks

The objectives of this thesis were to: explore the effectiveness of the carbon footprint as a tool to inform and engage tourism stakeholders in the transition to a low-carbon tourism economy; determine opportunities and challenges associated with a transition towards a low-carbon destination, and to see how these opportunities could be enabled.

The thesis provided a novel and valuable contribution to a complex and pressing public policy issue facing tourism. The co-creation of knowledge through a combination of carbon modelling, stakeholder dialogue and individual perspectives, proved invaluable to enhance understanding about the opportunities and challenges surrounding carbon reduction and economic growth in tourism systems. The stakeholder acceptance of the knowledge and their perspectives on potential change in tourism systems supports the argument that progress to a low carbon tourism system is possible.

The increasing recognition of tourism's responsibilities and role in a low carbon economy is evidenced by the inclusion of climate change in the redrafting of the Sustainable Tourism Charter on the eve of the COP21 climate change talks in Paris in November 2015: "The travel and tourism industry is therefore addressing the challenge of spearheading the global movement in favour of a low carbon economy" (World Summit on Sustainable Tourism, 2015). This thesis is part of a growing body of knowledge concerned with providing the conceptual platform and evidence for tourism destinations to play a proactive part.

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